ROADS and STREETS

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTRUCTION

Gillette Publishing Co., 22 West Maple St.
Chicago 10, Illinois

MAY 1955

Special Report on

CONTRACTORS' BLASTING METHODS

Precasting 70-Ton Slabs

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Acceptance Authorized Under Sec. 34.64 P. L. & R.

Texas Builds Soil-Cement Widening—2 Miles a Day*

P&H Soil Stabilizer Processes 9,000 Sq. Yd. Daily With Perfect Control of Quality

Close-up of P&H Model LA-88 Single Pass Stabilizer processing soil-cement.

Texas State Highway 79, originally built in 1928-29, was recently modernized in record time for today's traffic needs.

State Highway Officials decided the old 18-ft. pavement should be widened to 24 ft., for a total of 17 miles. Low-cost and maximum use of local materials were musts. Low bidder among nine contractors was Austin Asphalt Company, Dallas.

P&H Stabilizer Key to High Production

With the old shoulder soil removed to a 14-in. depth and an 8-ft. width on one side, 30 cu. yd. per station of crushed sandstone were dumped on

Behind the Stabilizer, two sheep's-foot rollers compacted the mixture.

the concrete pavement at regular intervals. This was bladed into the trench, watered and rolled for an 8-in. sub-base. Over this, 20 cu. yd. per station of crushed sandstone were placed to a 7-ft. width. Cement, for an 8% cement factor, was then spread, working no more than 1,000 ft. ahead of the P&H Soil Stabilizer as a guard against cement loss. Actually, this distance ahead was rarely reached, though, because of the high mixing speed which the Stabilizer maintained.

A More Stable, More Durable Base

Behind the cement spreader, the P&H Stabilizer pulverized the partially compacted sandstone, dry mixed it with cement, added the proper amount of water and deposited a uniform layer of soil-cement ready for immediate compaction.

Here curing seal is applied at the rate of 0.2 gallon per sq. yd.

Then, after curing, a 250 lb. hot-mix bituminous surface was placed over the old pavement and widening in two courses to complete modernization of this veteran road. The road was kept open to traffic throughout construction and the widening was opened to traffic as soon as the curing seal was blotted.

For more information on P&H "Single-Pass" Soil Stabilizers, write to C. R. Morgan Jr., P&H Soil Stabilizer Division, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

Side view of P&H Model LA-88 Stabilizer. Only 1 man required to operate.

** The following data is based on a January, 1955 presentation to the American Road Builders' Association Committee on Soil-Cement stabilization by Mr. A. D. January, Wichita Falls, Texas, Senior Resident Engineer of the Texas State Highway Dept.*

HARNISCHFEGER

. . . for more details circle 196, page 16

Galvanized Beth-Cu-Loy culverts simplify installation and maintenance

Because it is made of steel, a culvert of Beth-Cu-Loy galvanized sheets is strong, yet light enough to be handled easily and economically. Its flexibility makes grade maintenance and alignment relatively easy. Its long lengths reduce the number of field joints. And its copper content, plus generous prime zinc coating, provide rust-resisting qualities that assure long service life for the pipe.

Galvanized steel offers many other advantages for drainage installations. Culvert pipe made of galvanized steel will withstand impact and the actions of freezing and shifting soils. It needs no cradling in unstable soils, and does away with the root hazard. It conforms to the rigid standards of the American Association of Highway Officials' specifications.

Bethlehem does not fabricate culvert pipe, but manufactures Beth-Cu-Loy galvanized culvert stock for those who do fabricate it. For the names of fabricators in your area, just drop a line to the nearest Bethlehem office.

Culvert can be shop-made in long sections, reducing number of field connections. Simplicity of joints themselves is another economy feature.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

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ROADS AND STREETS
Sixty-Three Years of Editorial Leadership

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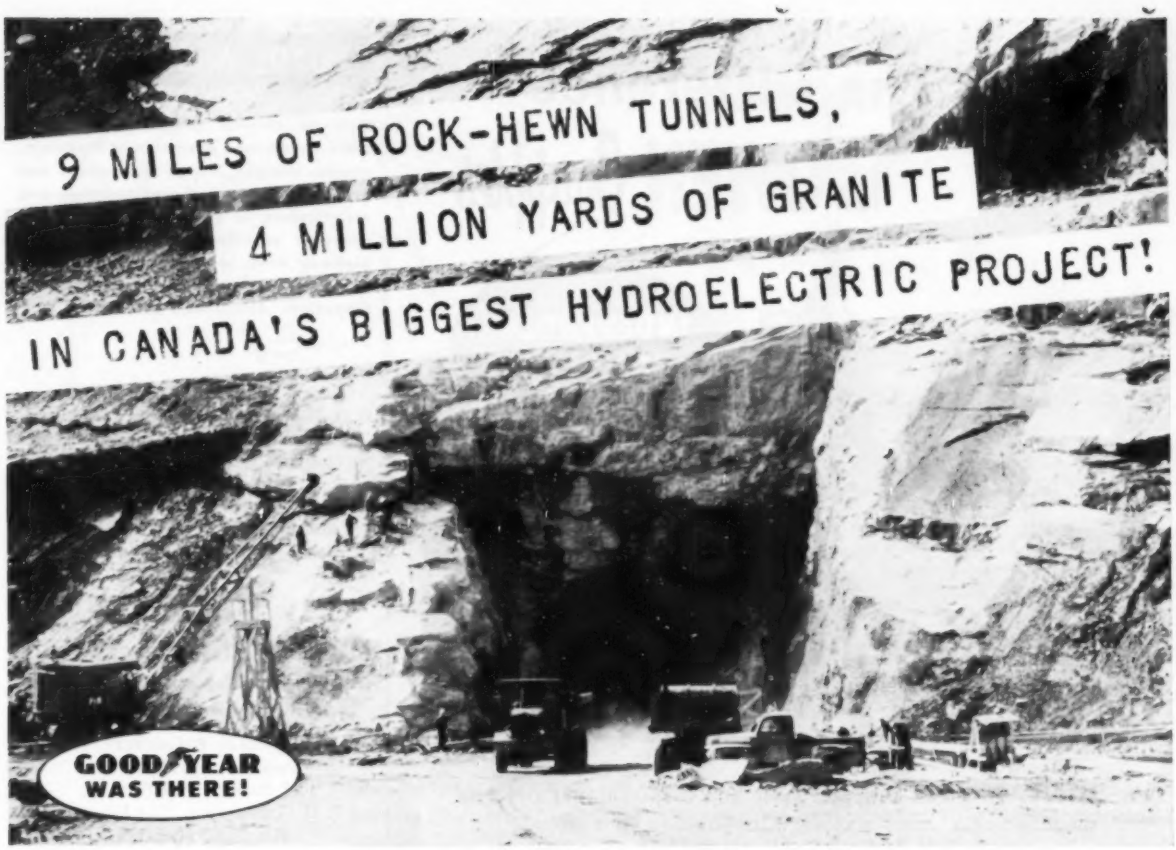
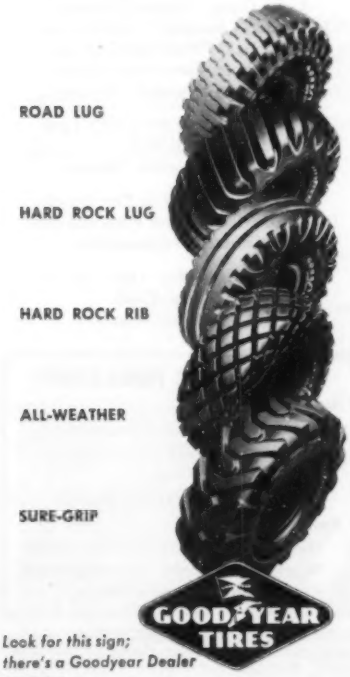


5,000 MEN and a huge intercompany pool of equipment are damming the Bersimis and Desroches rivers so 1,200,000 horsepower can electrify southern Quebec and the Gaspé Peninsula. Photo shows rock haulers at mouth of 35-foot diameter, 9-mile tunnel that leads to subterranean powerhouse 565' x 65' x 80' – carved and blasted out of granite too tough for drills! It takes phenomenally durable tires to stand up to the tremendous loads and razor-sharp blasted rock – which is a reason why GOODYEARS ARE THERE!



Look for this sign; there's a Goodyear Dealer near you

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3-T NYLON CORD

provides toughest tires in Goodyear history!

Underneath the armored treads and sidewalls of Goodyear off-road tires is something new and wonderful—3-T NYLON CORD, *exclusively Goodyear's.* It gives tires such vast new durability that users say bruise-breaks and heat-blowouts are practically unknown! Tire growth is controlled—and ply separation and flex failures are virtually eliminated! 3-T NYLON CORD has *added so much* to tire life—*subtracted so much* from operating costs—that you should see the facts-of-record before buying or specifying *any* tire for *any* operation. Goodyear Truck Tire Dept., Akron 16, Ohio.

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE BUILT WITH 3-T NYLON CORD

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, All-Weather, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 63 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892.

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HOW COME HYATTS ARE BETTER BEARINGS?

I'll tell you, says HY WHEELER, the sage of the socket wrench:

The *big* thing is, Hyatt's got more *know-how* than anybody else in the roller bearing business. Hyatts have been standard equipment on most cars, trucks and tractors since the early days, and brother, don't think all that experience don't make a difference!

F'rinstance, Hyatt's got a way of grinding the inside diameters of races that guarantees absolutely uniform wall thickness—developed it themselves. They use the finished race O.D. to produce perfectly concentric I.D. It's these "little" things you can't see with the naked eye that make a big difference in performance—and make me keep sayin':

There's other bearings that *look* as good, but you *hold out for Hyatts in the blue and yellow box.* When it comes to *quality,*

DISTRIBUTED BY DEALERS EVERYWHERE

A GENERAL MOTORS PRODUCT

A UNITED MOTORS LINE

there's no substitute for . . .

HYATT ROLLER BEARINGS

STRAIGHT ROLLER BARREL ROLLER TAPER ROLLER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

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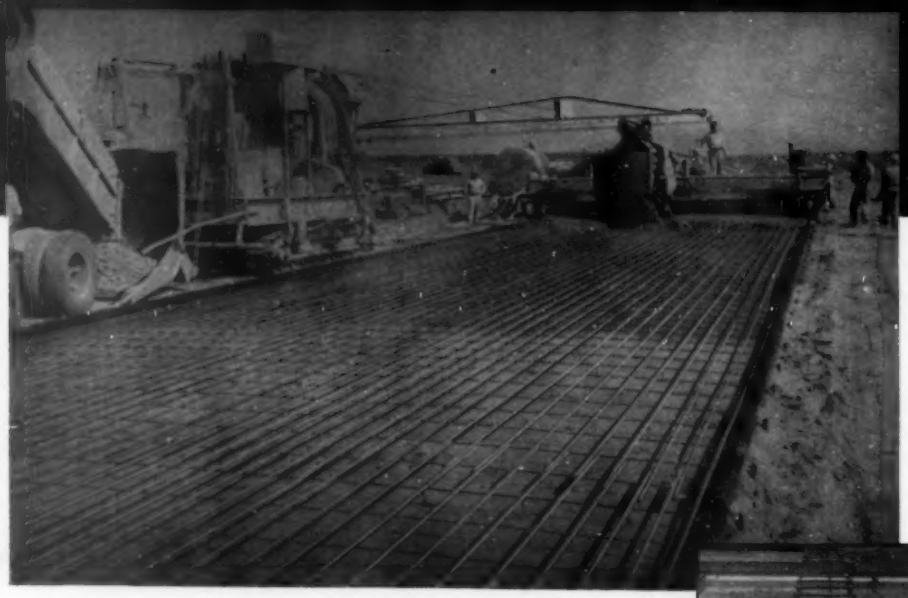
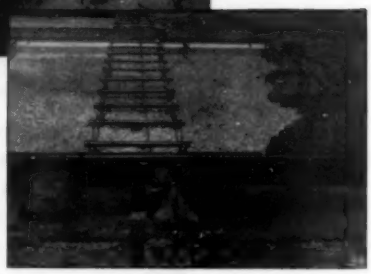
Picture of a Good Road's Backbone





Laclede Welded Spacers
Assure Dowel Alignment

with LACLEDE Distributed Steel Reinforcement

For smoother-riding, safer concrete pavements with long life, safety and low maintenance costs, engineers specify

LACLEDE HIGHWAY STEELS

- **WELDED WIRE FABRIC (in sheets)**
- **WELDED DOWEL SPACERS**
- **MULTI-RIB REINFORCING BARS**
- **ACCESSORIES**
- **CENTER JOINT**
- **RECESS JOINT**

® LACLEDE
Producers of Steel for Industry and Construction

LACLEDE STEEL COMPANY
ST. LOUIS, MISSOURI

. . . for more details circle 206, page 16

FACE LIFTING Contractor's Hill IN PANAMA

Huge rocks are blasted from benches for hauling to the spoil area in 22-ton "Eucs" that are working 20 hours a day to meet the 15 month contract deadline.

Gaillard Cut is the narrowest section of the Canal—Contractor's Hill, at left in this photo, threatens to slide into the channel. It is being benched to shift center of gravity away from the Canal.

Tecon Corp. picked "Eucs" for this big rock job

When Tecon Corp. was awarded the contract for this 2 million yard face-lifting project, they knew they had an urgent and mighty important job ahead of them. If new fissures in Contractor's Hill caused a slide into the narrow channel at Gaillard Cut, the Panama Canal could be closed to shipping for many months.

To meet the 15 month contract deadline, 8500 yds. of solid rock must be moved every day to a spoil area a mile away. Because of their experience with Euclid equipment on other tough jobs, Tecon chose Rear-Dump "Eucs" of 22 ton capacity. A fleet of nine machines with 300 h.p. engines and Torqmatic Drives were rushed to the site and are working 20 hours a day.

On big jobs like this one, as well as on more routine construction and mining operations, the dependable performance of "Eucs" gets more work done at lower cost per ton or yard. Your nearby Euclid dealer will be glad to provide facts and figures on the complete line of Euclid earth moving equipment.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

EUCLID THE PIONEER

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

. . . for more details circle 191, page 16

ADC* Oilprint Analysis

CHECKS CRANKCASE OIL IN MINUTES

Shell Research gives you new oil-change yardstick—

Now—operators can test crankcase oil in the short time allotted for refueling and crankcase oil checks. The Shell ADC Oilprint Analysis gives a practical and accurate oil evaluation in minutes.

ADC Oilprint Analysis means big savings when used in your preventive maintenance program . . . gives valuable information on engine and oil conditions. It answers the question "When do I change my oil?" thus eliminating the draining of usable oil and the risk of using oils loaded with contaminants.

See for yourself how the new Shell ADC Oilprint Analysis can save you money in preventive maintenance. Let us show how you can use this new service for your equipment.

SAVES... Time, Money, Engines, Oil

*Trademark

SHELL OIL COMPANY,

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

TAKE OUT

Save as much

ATECO

On a main highway through Pittsburgh, Pennsylvania, this ATECO Ripper took out 30,000 square yards of paving ranging from 10 inches to 20 inches deep. This paving consisted of concrete with an asphalt surface, plus a layer of Belgian blocks in between.

An ATECO Rock Ripper removed 176,000 square feet of asphalt surfacing in two working days on this boulevard in Squirrel Hill, Pennsylvania.

ATECO

EARTHMOVING EQUIPMENT

PAVING IN ONE PASS

as 25% on a job with the

ROCK RIPPER

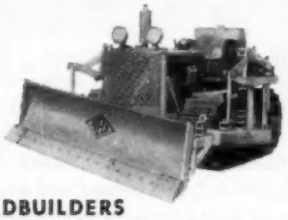
This ATECO Rock Ripper will take out cement, asphalt, Belgian block, and other types and combinations of paving in one pass. On the projects pictured here surfaces up to twenty inches thick were removed.

Contractors using the ATECO Rock Ripper have estimated savings up to 25% in time, money and manpower. On big projects this tool can probably pay for itself and pay extra dividends through time-saving alone.

Here are some of the construction and operating features of the ATECO Rock Ripper:

- **Heat-treated alloy steel, weight, 8000 lbs.**
- **Fully tractor-mounted**
- **Hydraulic powered**
- **18-inch or 24-inch penetration**
- **Replaceable rock points**
- **Operates with 1, 2, or 3 tool standards**
- **Underground "quiver" of standards helps shatter rock and shale**
- **Swivel-mounted standards allow 15° swing either way**
- **Maneuvers in small area, turns and backs easily**

ASK YOUR DEALER ABOUT THE PERFORMANCE OF THIS GREENVILLE-ATECO EQUIPMENT, TOO:



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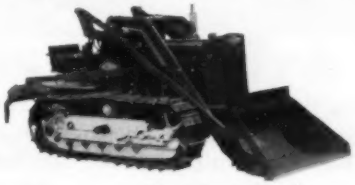

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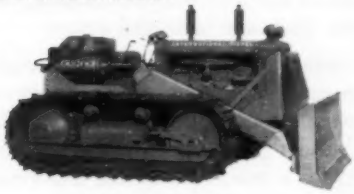

BULLDOZERS

SCRAPERS

Use this coupon for further details on the Rock Ripper and other GREENVILLE-ATECO equipment. Your dealer can arrange to show you motion pictures of the Rock Ripper in action.

by **GREENVILLE**
STEEL CAR COMPANY
GREENVILLE, PENNSYLVANIA

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ATECO Division, Greenville Steel Car Co.
Greenville, Pennsylvania

☐ Please send me further details on the ATECO Rock Ripper.

☐ I'd like information on other ATECO Equipment.

My construction equipment is purchased from:

DEALER'S NAME _____

ADDRESS _____

MY NAME _____

ADDRESS _____

CITY _____ STATE _____

A New, Time-Saving Experience is Yours

with the

Tractomotive TL-12 TRACTO-LOADER

Our long experience building the famous Tracto-Shovels serves us well in manufacturing our line of wheel loaders. We know the time-saving advantage of the hydraulic torque converter drive from working with it in crawler tractors . . . and we know how to apply it to a wheel loader. That's why you get smooth, fast loading with the TL-12 Tracto-Loader — no slow, mushy starts and stops — torque is multiplied THREE TIMES!

Tractomotive also developed the CLUTCH-TYPE TRANSMISSION in wheel loaders — saves gear shifting . . . operator just pulls a lever to change direction.

In addition to these time-saving advantages, you get a TIP-BACK BUCKET which gives you a "scooping action" to further speed loading. This feature also enables you to carry a full bucket at a lower position — means greater stability, easier maneuvering, better visibility.

There is 4-WHEEL DRIVE for excellent traction and POWER STEERING for easy handling under all operating conditions . . . plus high lift and long reach, strong, pin-connected axles, unit assembly of major parts—many performance and service features that save time and money.

It's the combination of advantages that makes the TL-12 an outstanding excavator-loader . . . but the best way to size it up is to see it in action, on your job, under your operating conditions. You will be in for a new, time-saving experience.

The Latest in Loaders...
By the Leader in Loader Design

• 1-cu-yd Bucket • Weight 12,100 lb
• 63 Brake hp

Sold and Serviced by your Allis-Chalmers Industrial Tractor Dealer

TRACTOMOTIVE **TRACTOMOTIVE CORPORATION**
DEERFIELD, ILLINOIS

Tracto-Loaders • Tracto-Shovels • Side Booms and Hydraulic Rippers for Allis-Chalmers Crawler Tractors
• Loader and Shoulder Maintainer for Allis-Chalmers "D" Motor Grader

. . . for more details circle 241, page 16

B.F.Goodrich

All-nylon tires end tire failures for rock products company

TRACY Rock and Gravel Company trucks are scheduled to make the round trip between quarry and crusher in 8 minutes. Such close timing is necessary so that this Tracy, Calif., firm can keep its output up to the demands of the construction industry. Setting the pace is one thing, maintaining it another.

Tires broke and treads separated under 30-ton payloads. Some tires lasted only 100 hours. Valuable time was lost. Maintenance costs soared. But B. F. Goodrich *all-nylon* tires solved these serious problems, Chief Mechanic W. S. Floyd reports. After 2 years on the job, "they've never been off the rims!"

Nylon is stronger than ordinary cord materials, can withstand double the impact. *All-nylon* tires last far, far longer, put an end to premature tire failures.

Tracy uses *all-nylon* Super Traction tires because the wide tread gives greater flotation. The *all-nylon* Universal tread gives full traction in forward or reverse. And the *all-nylon* Rock Logger tire resists rock cuts.

All B. F. Goodrich Rock Logger and Universal tires (sizes 12.00 and larger) are made in *all-nylon* construction. Smaller sizes in *all-nylon* or rayon. See your B. F. Goodrich retailer today. His address is listed under Tires in the Yellow Pages of your phone book. Or write *The B. F. Goodrich Company, Tire & Equipment Division, Akron 18, Ohio.*

ALL-NYLON SUPER TRACTION tires pull through grueling time schedule under 41-ton gross weight.

UNIVERSAL TREAD guards against dangerous slippage, keeps trucks moving. Maintenance costs are cut.

Specify B. F. Goodrich tires when ordering new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

. . . for more details circle 193, page 16

WHAT'S NEW in Equipment and Materials

Long Life Water Can

A new water can and cooler line, available from Acton Manufacturing Co., Inc., 605 S. Summit St., Arkansas City, Kans., features a special galvanized material. The new galvanize is electrolytically bonded to the metal and does not flake away to cause early rusting and deterioration of an otherwise sound can. The "Bull's-Eye" line is soldered and sealed throughout for guaranteed vacuum-tight construction, which is stated to provide ideal dead-air insulation for colder water — longer. The advanced design also insures perfect fitting of the lids. Available in four sizes — 1½-2-3 and 5 gal. either with or without fiber-glass insulation and semi-recessed faucets.

For more information circle 101 on Service Coupon this page and mail now.

Flexible Boots for Power Shovels

A line of zip-on boots to protect a wide variety of outdoor machinery including power shovels have been developed by A & A Mfg. Co., Inc., 2017 W. Clybourne St., Milwaukee 3, Wis. Fabricated from weather-proof, neoprene-base materials the new line of closures permits a degree of flexibility without cracking. One or more of the water tight zippers are built in as required to facilitate attachment out on the job in field service. In a single design several weights of the neoprene-base material may be employed. Parallel supports can be added to the convolutions to avoid sag under field conditions where dirt, sand and mud accumulate heavily on the protective covers.

For more information circle 102 on Service Coupon this page and mail now.

Machine Prints Traffic Lines

Traffic and safety lines that are printed — rather than brushed or sprayed are now possible as the result of an improved all-metal, sled-type, roller spreader perfected for its Universal controlled-flo traffic-line paint-striper by the Line Marker Division of Universal Yonkers Corp., 30 Woodworth Ave., Yonkers, N.Y. The machines come in five models ranging in paint capacity from 3 to 10 gal. The machine is gravity fed and has no power unit.

For more informations circle 103 on Service Coupon this page and mail now.

Herbicide Has New Chemical Principal

Baron, a nonselective herbicide which brings a new chemical principal to vegetative control, has been announced by The Dow Chemical Co., Midland, Mich. The new product is a liquid which emulsifies readily in water. Baron may be sprayed on leaves, which take it up directly; or it may be sprayed on the soil, from which it is taken up by roots. Its translocation from leaves is relatively independent of rainfall moisture. When applied to the soil it acts as a residual sterilant, lasting for approximately a season, its effective persistence depending upon various factors. Baron applied to foliage exhibits early contact action which produces a prompt reduction of the vegetation and defines the treated areas. This is followed by systemic action which effectively kills most plant species to which it is applied. It has proved to be highly effective against almost all perennial grasses as well as herbaceous plants upon which it has been tested. Baron is easy to use in conventional weed-control spray equipment. It presents no problems of corrosion. Its animal toxicity is very low. Recommended rates of application range from one to two pints per square rod, corresponding to 100 to 160 lb., erbon equivalent per acre.

For more information circle 104 on Service Coupon this page and mail now.

More equipment news pages 138-151, 176-179

Disc-Type Idlers for Cat Tractors

Disc-type idlers have become standard equipment on Caterpillar D6 tractors and No. 6 traxcavators, according to an announcement by Caterpillar Tractor Co., Peoria Ill. The smooth sides of these new, wider, fabricated idlers prevent foreign material such as limbs, brush and rocks from becoming entangled or jammed in the idler.

For more information circle 105 on Service Coupon this page and mail now.

Penetrant for Loosening Corroded Nuts

A new product, stated to be the first non-oily penetrant for loosening corroded nuts or bolts and large sized parts of mechanical equipment, has been developed by Olin Mathieson Chemical Corporation, 10 Light St., Baltimore 3, Md. The product is claimed to be more effective than oils. It is fast acting and penetrates deeply. It is safer to use because it is nonflammable and does not spread over the work. It is being distributed by NAPA jobbers for retail sale through garages and service stations. The penetrant can be applied by pour spout or squirt gun. After several minutes, the work is tapped with a hammer and parts can then be disassembled, using the proper tools.

For more information circle 106 on Service Coupon this page and mail now.

For more items . . . see page 138

MAIL THIS COUPON TODAY!

ROADS & STREETS
22 West Maple Street
Chicago 10, Illinois

CIRCLE THE NUMBERS AND MAIL NOW!

Please send me further information on products and materials mentioned in the May ROADS AND STREETS as circled below

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Street_____

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NOT GOOD AFTER JUNE 15, 1955

A READER SERVICE FOR YOUR NEEDS

"Euc" Scrapers belong in your profit picture

Struck capacities of 7, 12, 15.5 and 18 cubic yards.

Profit-making features of Euclid Scrapers pay off in high production at low cost. Owners know from experience that they get more pay yards per hour with lower operating and maintenance cost, and that means low cost per yard.

They know, too, that "Euc" Scrapers have unequalled job availability because of their simple, rugged design and easy servicing. For example, there's no down time due to cable breakage because all scraper operations are lever actuated and independent . . . and the adjustable, long-life cutting blade with four identical and reversible sections assures peak production in all types of material from sand to sticky clay.

For performance and production data on work similar to yours, have your Euclid distributor provide helpful facts and figures on "Euc" Scrapers and see the new color movie, "Equation for Profit" that shows how "Eucs" can improve the profit picture on your earth moving work.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

EUCLID THE PIONEER

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

. . . for more details circle 267, page 16

SIX YARDS PER MINUTE

SERVES 12 TRUCKS

The Domor Elevating Grader keeps 12 trucks busy on a 2.7 mile round trip haul from a borrow area to a 4 lane by-pass on route 231 at Huntsville, Ala. Trucks loaded out with red clay at the rate of 6 yards per minute moved 40,000 yards in 20 working days.

C. G. Gray, partner of Ashburn and Gray Contractors, says, "We can load as much with the Domor Elevating Grader as we could with two 1 yard shovels — and at half the cost."

See your CATERPILLAR-ULRICH Dealer

DOMOR ELEVATING GRADER
ULRICH
PRODUCTS CORPORATION
ROANOKE, ILLINOIS

ULRICH
PRODUCTS CORPORATION
Roanoke, Illinois

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ROADS AND STREETS
Sixty-Three Years of Editorial Leadership

Washington News Letter

By Duane L. Cronk May 9, 1955

Latest twist in highway legislation was the approval last week by the Senate Subcommittee on Roads of a bill which if passed would for the next five years:

—Provide $1.1 billion annually in Federal Aid for the primary, secondary, and urban systems, to be matched on a 50-50 basis.

—Provide federal funds for the Interstate System accelerating from $1.0 billion the first year to $2.0 billion the fifth year - 75-25 basis.

—Raise the federal gasoline tax from 2 cents to 3 cents.

—Ban truck weights exceeding the federally fixed limits.

—Authorize the federal government to purchase right-of-way in advance for Interstate System projects, with 25% reimbursement by the states.

The bill abandons the major features of the President's original plan.

* * *

The attitude is different in the House, however. Representatives are taking Ike's proposal seriously. They are listening to witnesses, not debating with them. There is little of the political bickering which attended the Senate hearings. One much respected Representative summed up the fresh approach: "The less time we spend in getting down to construction here, the better off we are."

Federal regulation of truck weights and loads should be written into any new legislation for the network, some Congressmen are asserting. The Bureau of Public Roads is standing by its currently recognized axle load limit of 18,000. (There are about 600,000 trucks in use now with axle load capacity of 18,000 pounds or over.) It is anticipated that such regulation will have to wait on the outcome of the AASHO road tests.

* * *

Right-of-way and control-of-access standards for the Interstate System, also, are coming under attack. Congressman John Dempsey from New Mexico has accused the BPR of arbitrary regulation and of advising state highway departments "to go along with those guides. . . or else."

Referring to application of the standards to through-city routes, he said, "A 150 foot right-of-way on Central Avenue in Albuquerque would mean cutting down every building on the street." The Bureau, Commissioner Curtiss

(continued on next page)

insists, must maintain reasonable standards to protect investment in the interstate system, but does allow for local conditions.

The kick-off for another "grass-roots movement" for good roads was seen in Washington last month. Backing the campaign, announced Chairman Arthur O. Dietz, president of Commercial Investment Trust, will be automobile manufacturers, industrialists, realtors, materials producers, and bankers. Their title --"Highways for Survival Committee." Their goal: publicity for the Administration's roadbuilding program to spur Congress action this year.

* * *

How much mileage is feasible for toll financing was revealed by BPR's Commissioner Curtiss last month. Without disclosing details of the still secret bureau study, Mr. Curtiss said that 6,700 additional miles on the National Interstate System could be self-liquidating. There are about 2,621 miles of toll roads completed or under construction now.

* * *

A breakdown of costs for the $27-billion National Interstate System released by Francis du Pont, Special Consultant to the Secretary of Commerce, lists the following:

Rights-of-way	14%	Subgrade	20%
Grading	30%	Surface	15%
Structures	21%		

Mr. du Pont gave the analysis in making the point that once established, the only real depreciation in the system will be in surfacing.

* * *

Relocation of utilities cost about $45 million in 1953, the Bureau of Public Roads revealed last month, the essence of its study on the controversial subject. This was 2.6% of the total state highway construction cost. Utility spokesmen have been pressing for federal aid to reimburse power, phone and gas companies for relocation of facilities on road jobs. They want up to 5% of the total cost of a project. The study covered 5,422 relocations on 3,836 highway projects involving 14,000 miles.

* * *

Overwhelming support of Eisenhower's proposal that Uncle Sam finance the National Interstate System has come again from the state governors. Last month, Senator Gore, chairman of the Senate Subcommittee on Roads, wired the governors for information on their ability to match increased federal aid. The governors' response was that they could not do the job through matching funds, that federal government should assume responsibility for the Interstate network.

The results of the survey of matching ability come as a blow to any hope that the nation's road needs can be met merely by increasing federal aid.

WHAT Users Say About Bucyrus-Eries and WHY

NEW MEXICO, CONSTRUCTION SUPERINTENDENT, steam generating plant: *"This machine (22-B Transit Crane) is handling approximately 600 tons of material on this job, including the setting of structural steel and machinery installations. The only repair we have had on this machine amounted to less than $10.00."*

TENNESSEE, OWNER-OPERATOR, excavating fuel tank pit: *"A power shovel operator most of my life, I know machines, and this Bucyrus-Erie 10-B dragshovel is just the kind of machine I've always wanted: easy to move from one job to another, fast to handle in operation, exceedingly powerful for its size, and relatively cheap to operate. Machine paid for itself in less than a year of operation."*

UTAH, OWNER, digging trench for water line: *"Pipeline contracting around Salt Lake City has grown exceptionally competitive but the rugged dependability of our 22-B dragshovel lets us get our share of the work."*

NEW MEXICO, JOB SUPERINTENDENT, setting structural steel: *"Have nothing but the highest praise for good control on your 22-B equipment. We made a difficult lens installation at an observatory last year, so ticklish that the job was insured for $250,000."*

OREGON, OWNER, constructing railroad shoofly track bed: *"We're exceptionally pleased with the ruggedness of our 38-B shovel. Despite heavy basalt rock excavation on this job, the machine has had no breakdowns."*

NEW JERSEY, OWNER, digging out lagoon: *"These 38-B machines are a big investment for me. I'm quite familiar with their ability to get the job done, and to stand up under tough working conditions. On this job, we're working in bay muck, and are exposed to salt air at all times. With no opportunity to clean up each night you can see what I mean when I say 'They have to be built right'."*

LOUISIANA, FOREMAN, dredging canal: *"Our 54-B dragline is operated 24 hours per day, handles 100 percent of the work, and we have had no downtime on this job."*

These are actual quotes* from users of Bucyrus-Erie excavators on various construction jobs throughout the country. In state after state, these experienced men say basically this: "We recognize the value of Bucyrus-Erie Individual Design . . . and we are convinced by the good, solid performance; sturdy, long-wearing construction; simple, easy operation; and on-the-job dependability of these machines."

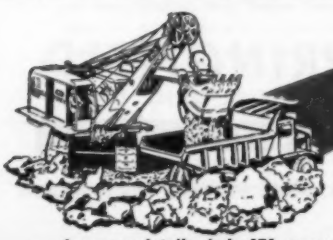
Consider these quotes carefully. Then see your nearby distributor for the complete story on Bucyrus-Erie general purpose excavators. With excavators ranging from ⅜- to 4-cu. yd. capacity and cranes from 3- to 60-ton (nominal ratings), there's a size—and front end attachment—to fit all your construction needs.

90E54C

**Names will be supplied on request.*

BUCYRUS ERIE

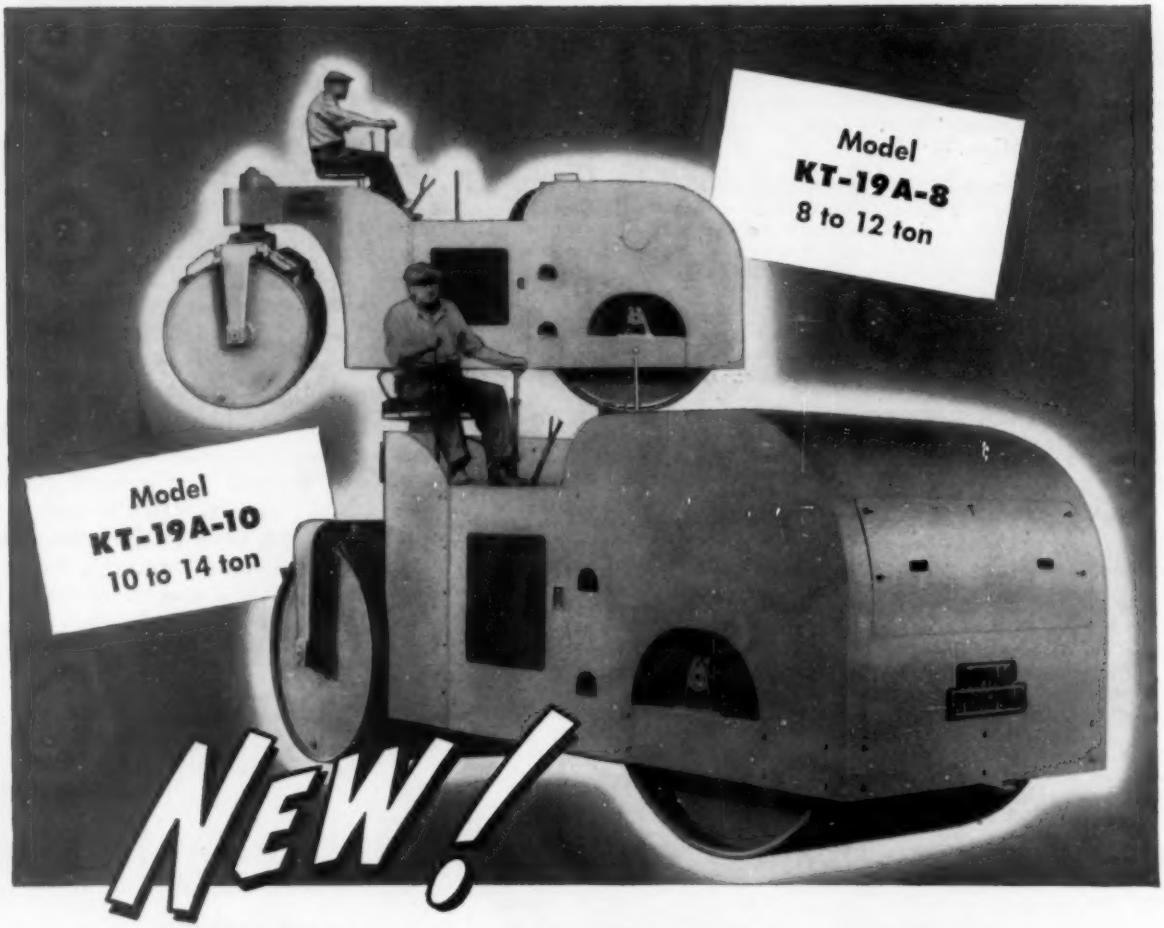
South Milwaukee, Wisconsin



See Your Bucyrus-Erie Distributor

SHOVELS • DRAGSHOVELS • DRAGLINES • CLAMSHELLS • CRANES

. . . for more details circle 171, page 16



BUFFALO-Springfield announces line of STANDARD TANDEM ROLLERS

These new STANDARD Tandem Rollers are designed especially for low-cost handling of any compaction job where pressures of from 8 to 14 tons are required.

Included as standard equipment is a heavy-duty, single-stage torque converter* that automatically matches power and speed to the material and grade variations of the job.

Without gear shifting, drivers can operate these rollers at any selected speed from 1 to 5 mph with the engine running continuously at its most efficient and economical power peak (2-speed mechanical transmission also available as optional equipment).

The heavy-duty, industrial-type engine (diesel or gasoline optional) delivers dependable power under all kinds of operating conditions. Buffalo-Springfield's widely-known bevel gear and final drive assembly offers the advantages of unusually low gear tooth bearing pressures, results in less wear, and is easy to adjust when required.

The massive, all-welded frame is heavily reinforced to maintain rigidity over a long operating life. Control instruments and levers are conveniently located to simplify the operator's job.

Ask your nearest Buffalo-Springfield distributor to tell you all about the new STANDARD Tandems. Dollar-for-dollar, feature-for-feature, they can't be matched by any other rolling equipment available today. Write for the new illustrated Bulletin No. S-68-555.

**Buffalo-Springfield has offered torque converter power since 1951.*

BUFFALO ROLLER COMPANY — **SPRINGFIELD** SPRINGFIELD, OHIO, U. S. A.

THE LEADER IN COMPACTION EQUIPMENT DESIGN AND MANUFACTURE

. . . for more details circle 255, page 16

There's a better way to keep your aggregate!

Stabilize your roads with MORTON SALT

There's no need to put up with costly aggregate loss — or bumpy, dust-ridden roads—when it's so economical and easy to stabilize them with Morton Salt.

Stabilizing gravel roads with salt:

- Cuts aggregate loss to a minimum and reduces surface damage (savings in aggregate alone more than pay for the cost of the salt) . . .
- Provides a tougher, smoother, safer, water-repellent surface . . .
- Holds down dust—minimizes frost boiling . . .
- Saves money on construction and maintenance. Salt-stabilized roads give more service per dollar cost than roads built by any other method.

Morton Salt also does an outstanding job of stabilizing the base course of primary roads—helps prevent the 9 out of 10 road failures which result from faulty foundations.

Free booklet gives you all the facts about Salt Stabilized Roads

Mail in this coupon today

MORTON SALT COMPANY
Industrial Division
120 S. LaSalle Street
Chicago 3, Illinois

- **Please send me free your new booklet on Salt Stabilized Roads.**

Name_____

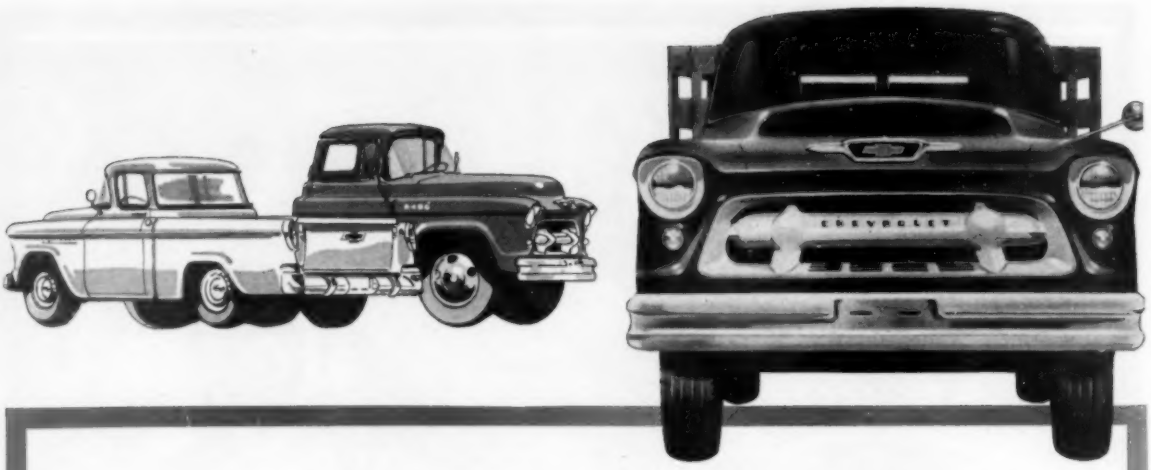
Title_____

Address_____

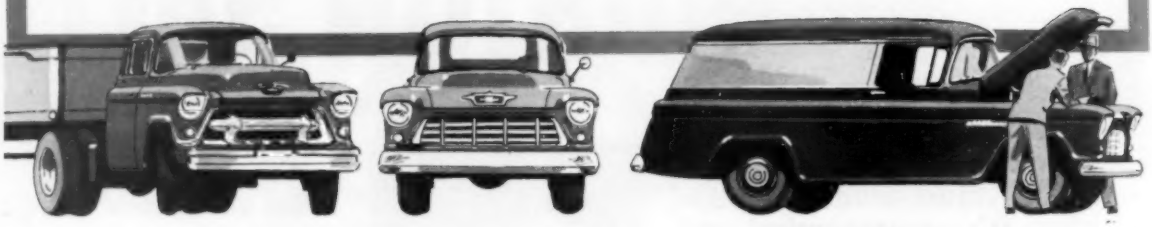
City_____ County_____ State_____

RS-5

. . . for more details circle 222, page 16



NEW CHEVROLET *Task-Force* TRUCKS



A new kind of truck styling

It's Work-Styling—an exclusive development in truck design with two distinctively different styling treatments. On the job, your truck "looks the part" and becomes a profitable advertisement on wheels for you and your business.

New "high-voltage" engines

Six of them! Each with a modern 12-volt electrical system for surer year-round starts and increased generator capacity—plus a long list of other new advances. They're the last word in smooth, quiet and thrifty truck power.

New frames of standard width

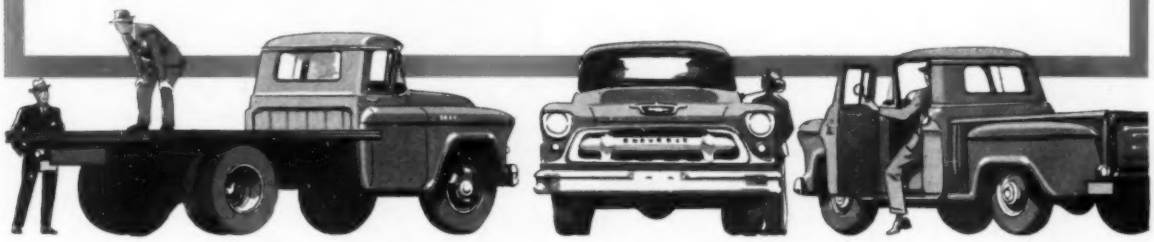
All models now have new ladder-type frames with full-length parallel side members for greater rigidity and longer truck life. Now, too, these newly designed Chevrolet frames are all 34 inches wide to accommodate special body installations.

New Overdrive—Truck Hydra-Matic

For even bigger gas savings and less engine wear, new Overdrive is available on all ½-ton models at extra cost. Hydra-Matic, Chevrolet's thrifty automatic truck transmission, is optional on ½-, ¾- and 1-ton models at extra cost.

CHEVROLET

They're setting the pace for the whole industry! Take a good look at them here... in the showroom . . . on the road. It won't take you long to discover that these are the most modern trucks on any job.

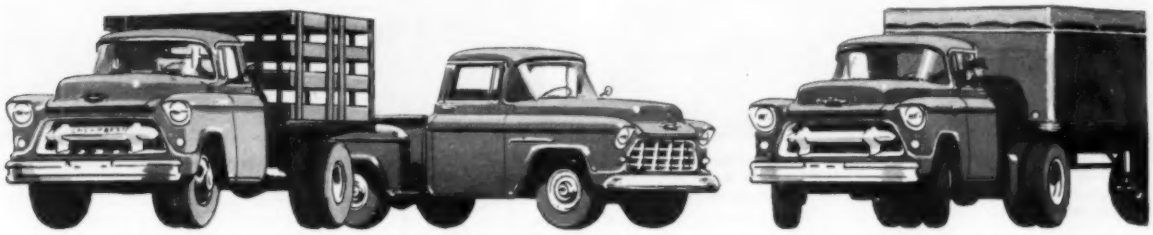


New 18,000-lb. G.V.W. capacity

The highest ever for Chevrolet! And that's good news for everyone with heavy hauling to do. For with this hefty hike to 18,000 pounds Gross Vehicle Weight, Chevrolet brings its famous economy and dependability to new heavy-duty fields.

A cab as new as the view

New Sweep-Sight windshield—plus more glass all around—for a wider, safer view. New High-Level ventilation for greater driver comfort. New softer seats. New, more durable cab construction. New concealed Safety Steps that stay clear in all weather.



Power Brakes standard on 2-ton models

This great power helper increases driving safety . . . reduces driver effort. You stop with up to one-third less pedal pressure—and you do it right now! Chevrolet Power Brakes are standard equipment on 2-ton models —optional at extra cost on all others.

There's more to tell, a lot more

Stop in and let your Chevrolet dealer give you the complete "all-new" story. There are many more good things to discover about the New Chevrolet Task-Force Trucks! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

. . . for more details circle 190, page 16

COMPACTING EARTH FILLS

ON HIGHWAYS, AIRPORTS AND DAMS, new records are being set every day by Southwest Compaction Rollers. Here two 75-ton rollers and Cat DW21 tractors are compacting 6" to 12" lifts with only 4 to 6 passes. They are keeping pace with the largest earth-moving equipment working on 24-hour job schedules in the High Sierras.

ONE YEAR AHEAD of schedule! This record on a large earth fill dam is partially due to the improved high speed of compaction by Southwest Rollers which are used exclusively on this job.

SPEED PAYS OFF! A fleet of four 50-ton Southwest Rollers, with Cat and Le Tourneau tractors, use their weight, their kneading action of tires and extra oscillating freedom to permit faster traveling.

ADAPTORS FOR TRACTORS, most models or types, are available at Southwest. On highway and housing projects, small 20-ton Compaction Rollers can be towed by motor graders or other power equipment.

VERSATILE! Any standard 4-section Compaction Roller can be converted into a 3-, 5- or 6-section roller. Parts for conversion are available as a complete package.

CONSTRUCTION MACHINERY DIVISION
Southwest Welding & Manufacturing Co.
ALHAMBRA, CALIFORNIA

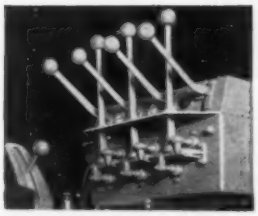
. . . for more details circle 253, page 16

More "Big Machine" Features on the MICHIGAN C-16 than on any other ½-yard crawler!

This is a fact: more "big machine" features are *standard equipment* on the MICHIGAN C-16 than on any other ½-yard crawler. It will pay you to look underneath — look inside to see how much more you get for your money.

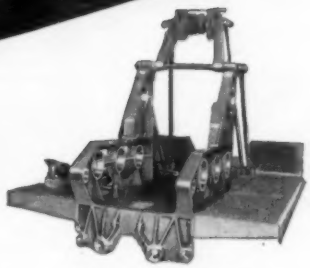
This machine is built for quality-conscious users—for bigger yardage, bigger tonnage, and substantially lower maintenance. The C-16 invites a feature-by-feature comparison with other same-capacity machines.

Write for detailed literature on this ½-yard crawler with big machine features and durability. Or contact your local MICHIGAN distributor. Like all MICHIGAN machines, the C-16 is available on a low-cost Lease Plan—details available.



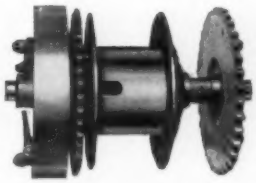
Power Control Independent Travel

Air Controls are standard on all MICHIGANs . . . fast, smooth, precise, with low operator fatigue. Independent Travel is also standard . . . move up while hoisting, swinging, or dumping.



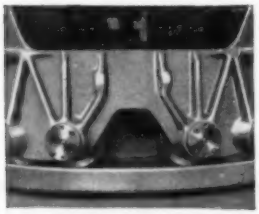
Cast Steel Deck

This feature is usually found only on 1-yd or larger machines. C-16 deck is one-piece, alloy steel casting . . . side frames, boom foot lugs and roller brackets are cast integral. No misalignment!



Power Load-Lowering

Four shafts on the C-16: Swing, Hoist, Travel and Crowd . . . each with its independent clutches. For precision crane work, the hoist line can be reeved on the front drum to provide Power-Up and Power-Down.



Six Hook Rollers

You can swing the boom just by leaning against it. There are 6 ball bearing-mounted adjustable hook rollers on the C-16 . . . grease twice a year. Most other ½-yd machines have only 3 or 4 rollers, bushing-mounted.

Smooth Clutches

There's nothing smoother than MICHIGAN air-operated segmented disc clutches . . . and they are self-compensating for heat, self-ventilating and self-cleaning. All segments are interchangeable.

Cast Steel Car-Body

Circle gear, with hook roller paths, internal gear teeth, center post, and crawler drive gear case is cast integral. Standard alloy steel tracks are 20″ wide, 9′10″ long. Swamp pads are optional: 30″ wide, 11′10″ long.

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY, 394 Second Street, Benton Harbor, Michigan. (29A)
Construction Machinery Division
Phone: WA 6-6184

Please send literature:

☐ C-16 Detailed Bulletin

☐ MICHIGAN Lease Plan Bulletin

Name_____

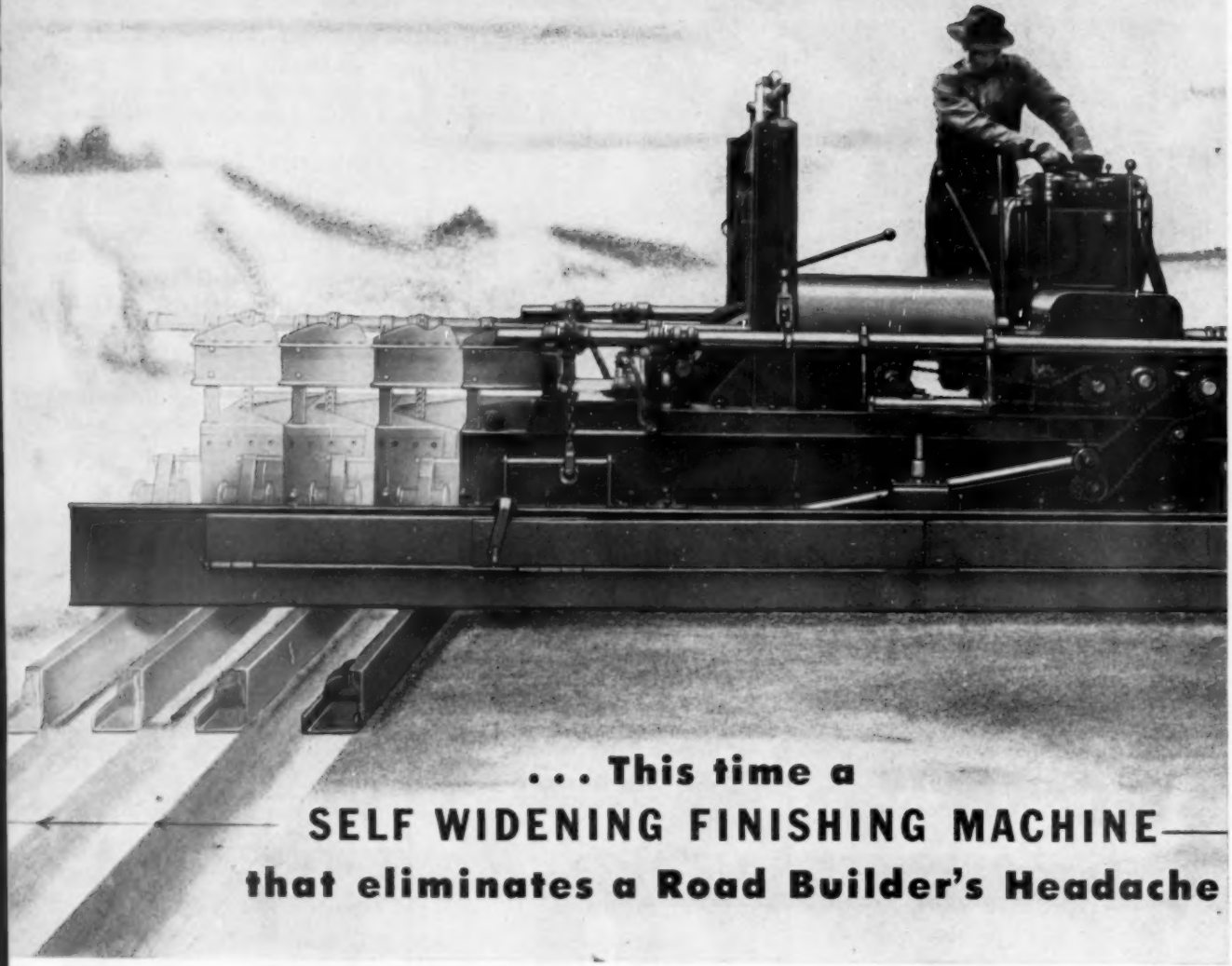
Firm_____

Address_____

City_____ Zone_____ State_____

. . . for more details circle 173, page 16

It's FLEX-PLANE



. . . This time a SELF WIDENING FINISHING MACHINE— that eliminates a Road Builder's Headache

Now, for the first time, a mechanical finishing machine will widen with a flick of a finger. What does this mean to road builders? Hundreds of hours saved in finishing interchanges, intersections, passing areas, pull-off areas or wherever the width of a highway varies.

Simply set your forms to follow the actual path of the finished roadway, pour your concrete and the Flex-Plane Self-Widening Finisher will do the rest. It's a completely new idea — *the frame widens — not the wheels.* A specially designed triple-lap frame gives the machine utmost rigidity even when completely expanded.

It's a real work horse that gives the finished roadway greater uniformity, reduces hand labor to an absolute minimum, permits the finish of wide and variable width areas without special form set-up and pouring operations. It's the greatest innovation in concrete finishing in recent years. Naturally, it can be used as a standard straight-line finisher, and with an extra wide range of widths.

Like so many other cost-reducing developments, the self-widening feature is found only

again!

A typical turnpike interchange

The above sketch represents a typical turnpike interchange. The darkened areas indicate roadway of variable width where the Flex-Plane *Self-Widening* feature would save dozens of man hours. The same machine, of course, would be used as a fixed width finisher for those sections where the slab is of uniform width.

on Flex-Plane Finishing Equipment. In fact, it's this kind of forward thinking that has made Flex-Plane the world's largest producer of concrete finishing machines. And it's the reason why you should talk with Flex-Plane before buying finishing equipment of any kind.

THE FLEXIBLE ROAD JOINT MACHINE COMPANY
WARREN, OHIO

FINISHING EQUIPMENT

. . . for more details circle 183, page 16

The Flexible Road Joint Machine Co.
4000 Thomas Rd. Warren, Ohio

Please send me latest information on the Flex-Plane Concrete Finishing Machine Line.

Name_____

Title_____ Company_____

Address_____

City_____ State_____

Build Profitime . . . Cut Downtime

with Firestone NYLON Off-The-Highway Tires

THAT's right! You increase yardage and profits and keep your downtime at a minimum with rugged Firestone Nylon Off-The-Highway Tires.

Whether it's earth moving, rock work or strip mining, Firestone can supply a rugged nylon tire specifically engineered for the job.

It costs you less to run on Firestone Nylon Tires because the treads give maximum traction and they are extra tough to resist cutting. The sidewalls are double thick to give added protection against cuts and snags. The new Firestone Safety-Tensioned Gum-Dipped* nylon cord body has four extra tread plies to insure longer tire life and more retreads. The Firestone Safety-Tensioned Gum-Dipped nylon body gives the greatest protection against impact breaks . . . flex breaks . . . heat failures . . . and water damage.

Let your Firestone Dealer or Store show you how Firestone Nylon Off-The-Highway Tires will cut your downtime and increase your profits.

*T.M. Reg. U.S. Pat. Off.

America's Future Progress Depends on Better and Safer Highways

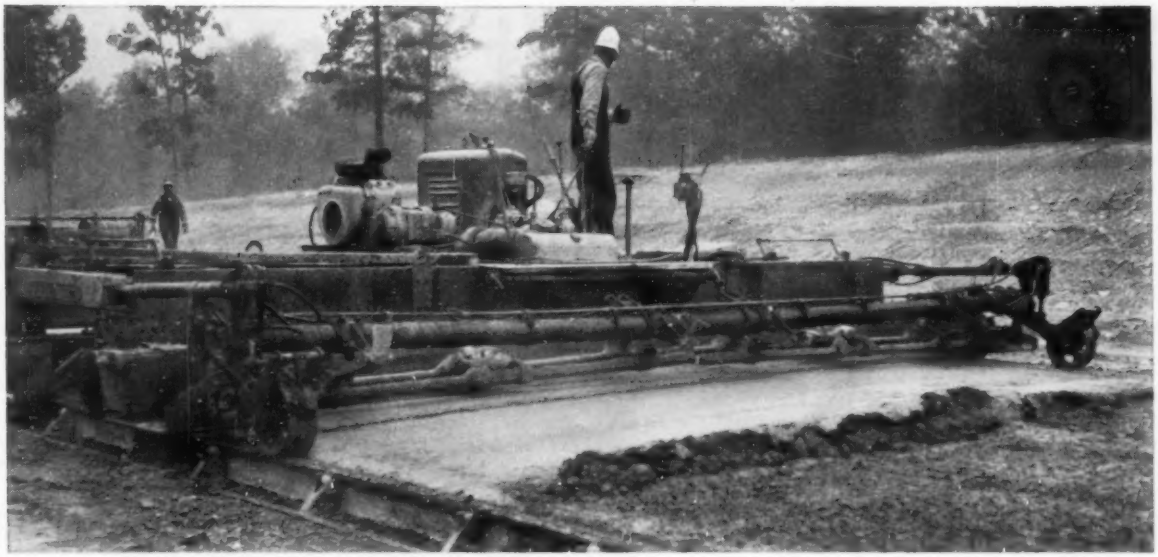
GROUND GRIP • ROCK GRIP • TRACTION ROCK • ALL TRACTION • ALL NON SKID • RIB EXCAVATOR

When you buy new equipment or replacement tires, specify FIRESTONE

Enjoy the Voice of Firestone on radio or television every Monday evening over ABC

. . . for more details circle 254, page 16

. . . for more details circle 183, page 16



Precision Finishing of Concrete The Jaeger-Lakewood Finisher is the most flexible machine yet developed for placing and finishing concrete slab. In addition to a wide range of independent travel and screeding speeds to meet any condition, Jaeger offers the unique advantage of a diagonally adjustable rear screed for laying pitched slab and super-elevated curves without the usual hand work along the higher form. Vibratory equipment includes exclusive bullnose vibratory screed where deep internal vibration is specified.

How Jaeger methods help low bidders

Screw Spreading of Concrete The screw action of the Jaeger Concrete Spreader remixes and intermixes all paver batches to one uniform texture and higher density, positively eliminating segregation. It also gives your operator closer control of the spreading operation. On high production work the Jaeger Spreader can be furnished with oscillating screed for precision strike-off ahead of the finishing machine. Saves the cost of one or more shovelers, and often, the need for a second finisher where otherwise specified. Vibratory equipment can also be furnished if desired.

Low Cost Spreading of Aggregates In one pass, the Jaeger Paver-Type Aggregate Spreader can lay all the tonnage your trucks can deliver — up to 10″ thickness of coarse stone or as much as 12″ of finer or graded materials in widths to 11′, or place an equal volume of material in lesser thickness up to 12′6″ width. You get that production with a machine that costs half the price of a bituminous paver and does accurate work on highway or airport base, or both base and top for secondary roads. Handles any aggregate, plant-mixed stabilized soil or free-flowing bituminous mix. Two models, to fit any trucks.

For full information on these machines and methods, operating data and prices, talk with your Jaeger distributor or write us. Catalog on request.

THE JAEGER MACHINE COMPANY

223 Dublin Avenue • Columbus 16, Ohio

AIR COMPRESSORS • PUMPS • LOADERS • CONCRETE MIXERS • TRUCK MIXERS

. . . for more details circle 203, page 16

Ohio Turnpike built to last

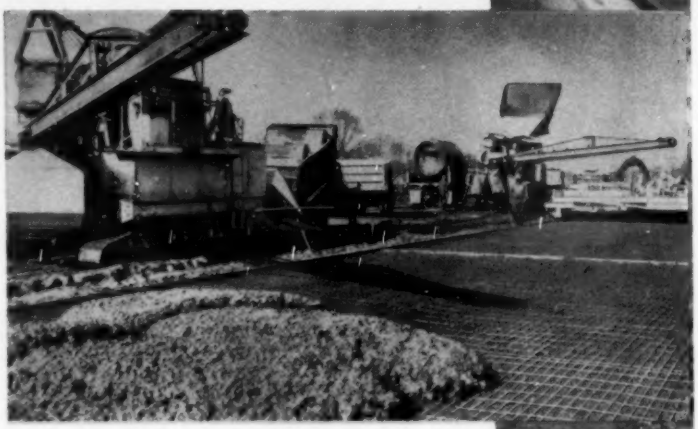
with

American Welded Wire Fabric

The pavement on the new Ohio Turnpike must withstand tremendous daily punishment. The Ohio Turnpike Commission has provided the needed strength and resistance to cracking by reinforcing the concrete with American Welded Wire Fabric.

The American Welded Wire Fabric together with adequately reinforced joints provides maximum corner protection, thereby increasing the strength of the concrete slab over thirty percent compared to slabs of other designs; thus insuring a much longer life for the pavement.

You will find American Welded Wire Fabric Reinforcement adding strength and life to other famous highways—the New York State Thruway, The Pennsylvania Turnpike, the Chicago Expressway—as well as secondary roads, and city streets. Specify it for all your paving.



IT PAYS TO ASK

"is it Reinforced"

AMERICAN STEEL & WIRE
DIVISION

UNITED STATES STEEL, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS · UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

USS AMERICAN WELDED WIRE FABRIC

UNITED STATES STEEL

ROAD JOINTS LIKE THIS—147,000 linear feet of them—were shipped to the job site assembled. These joints were specially designed by American Steel & Wire, to assure a joint assembly with all members in proper alignment at all times.

MISSOURI HIGHWAY DEPARTMENT
SPECIFIES FAILING RIGS BECAUSE:

"THEY ARE FASTER

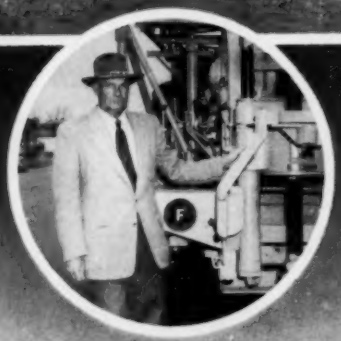
. . . THAN ANY EQUIPMENT
USED PREVIOUSLY!"

THE MISSOURI HIGHWAY DEPARTMENT, which is building and improving many miles of state roads in the "show me state," recently accepted delivery of its third FAILING Holemaster rig . . . the second one within a year.

These FAILING rigs are being used daily to take bridge soundings, to locate road material for quarrying and to establish grade lines.

Use of FAILING Holemasters is not an experiment with the Missouri Highway Department; they know these rigs will produce more hole, faster, and at less expense than any comparable drill. FAILING rigs have stood the test in Missouri.

This is true also in other sections of the country. More and more state highway departments are standardizing on FAILING equipment.



A. G. Copeland of Jefferson City, Mo., superintendent of core drilling for the Missouri Highway Department, who directs the work of the three FAILING rigs now being operated on a large scale road construction program in that state.

GEORGE E. FAILING COMPANY ®

George E. Failing Company

A SUBSIDIARY OF WESTINGHOUSE AIR BRAKE COMPANY

ENID, OKLAHOMA, U.S.A.

FAILING rigs are worth more NEW . . . worth more USED!

NATION NEEDS MORE ROADS!

TRAFFIC LOADS, SPEEDS BEING STEPPED UP!

GRAVEL SUPPLY SHORT IN MANY AREAS!

COSTS GOING UP!

Yes, the **PRESSURE** is on . . . **YOU!**

PLAN NOW . . . Better Stabilization . . . of Bases, Surface Shoulders . . . for a Total Cost of 5¢* per Square Yard with

STERLING ROCK SALT

"NATURE'S OWN SOIL STABILIZER"

STERLING ROCK SALT keeps your road mix "alive" . . . able to adapt itself and compensate quickly for excessive moisture or dryness, and sudden temperature changes. Water swells clay. But, in heavy rains, salt changes to brine, preserving the bond. In dry spells, salt crystallizes at the surface, preventing the clay binder from drying up.

Rock salt is soil's "thermostat" – the *natural* ingredient that keeps aggregates, fines and clay together in year-round permanence. Order your spring needs NOW or, for more information, send coupon.

**Actual cost-check from Hancock County, Ill.—$.0464*

INTERNATIONAL SALT COMPANY, INC.
INDUSTRIAL DIVISION, SCRANTON, PENNSYLVANIA

Get FREE Bulletins . . . "Better Highways Through Salt-Soil Stabilization"

Application methods and operational procedures . . . plant and road mixing . . . storage and handling hints . . . a wealth of helpful, practical on-the-job information.

IMPORTANT COUPON—MAIL TODAY

INDUSTRIAL DIVISION, DEPT. RS-5
INTERNATIONAL SALT COMPANY, INC., SCRANTON 2, PA.

☐ Please have representative call. ☐ Send complete file of "Better Highways" bulletins.

Name _____

Company _____

Address _____

City _____ **Zone** _____ **State** _____

. . . for more details circle 200, page 16

Rugged, Advance-Design HERCULES Dump Trailer Models

give fast, powerful action when you need it!

Pound-for-pound and year-by-year Hercules Dump Trailer Units permit more payload . . . more satisfaction . . . more profit than any other. Choose the *hoist* to fit your job! . . . Single or twin front-mount Telescopics, single or twin underbody Direct-Pushers. All Hercules Hoists are designed for maximum performance under *any* make trailer chassis! Choose the *body* to fit your job . . . from 14' to 21', square or bay front, 10 to 30 yards capacity, plus many other options. Hercules Trailer Bodies and Hoists are designed for any make dump trailer chassis . . . or . . . in complete package, "ready-to-roll," units.

HERCULES "Unitized" Dump Trailers

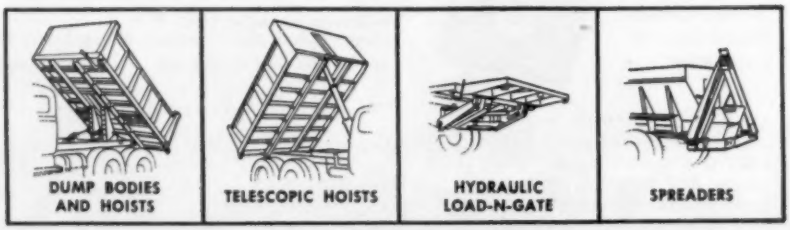
- *4 Wheeler Dump Trailer "Pups"*
- *Single Axle Semi-Dump Trailers*
- *Tandem Axle Semi-Dump Trailers*
- *Single or Twin "Front-Mount" Telescopic Trailer Hoists*
- *Single or Twin Underbody Trailer Hoists*

Ask your local Truck Dealer or Hercules Dump Trailer Distributor about the units to fit *your job* . . . or write the Factory direct for specifications and recommendations.

HERCULES 1905 1955 50th ANNIVERSARY

S503

Buy from the line of strongest design



HERCULES STEEL PRODUCTS CORPORATION • GALION, OHIO

UNISTEEL BODY CO., A Division of Hercules, producers of Standard and Custom Van Truck Bodies

. . . for more details circle 266, page 16

K-580 SHOVEL MOVES ROCK FASTER—operator works with greater speed and safety because of greater "live" weight built into every Link-Belt Speeder. All-welded, stress relieved construction gives greater strength per pound. Alloy cast-iron clutch shells assure superior friction, longer lining life. Independent rapid boom hoist has power control up *and* down.

Now every Link-Belt Speeder shovel-crane has *Speed-o-Matic*®

—no lag, no jerk, no strain— *IT'S FULL POWER HYDRAULIC CONTROL*

Today Speed-o-Matic controls are *standard equipment* on every size rig in the entire Link-Belt Speeder line! Full power hydraulic control is your key to 25% extra production . . . more consistent profits in the ½ to 3-yard, 6 to 60-ton work range. Here's why:

- REDUCED OPERATOR FATIGUE—fingers, instead of muscles, put full power to work.
- SMOOTHER CYCLES—complete cycle is one fluid motion.
- MORE ACCURATE CONTROL—operator always safely *feels the load.*
- REDUCED CLUTCH ADJUSTMENTS—clutch piston is self-compensating for normal lining wear and heat expansion.
- 150 WORKING PARTS ELIMINATED—maintenance costs cut.

Join thousands of alert owners who are making more money with Link-Belt Speeders. Contact your Link-Belt Speeder distributor for details. LINK-BELT SPEEDER CORPORATION, Cedar Rapids, Iowa.

13,731

LINK-BELT SPEEDER

Builders of a complete line of crawler and rubber-tired shovel-cranes

. . . for more details circle 212, page 16

HUSKY WHITE DUMP TRUCKS in the Varney fleet are like this Model WC2864-OH with 10-yard body with heavy-duty hoist, husky front axle, 11.00 x 24 12-ply tires, 176-inch wheelbase, 506B transmission and SFDD4600 tandem rear axle with 9.02 ratio, inter axle differential.

Schedules UP... Operating Costs DOWN with WHITE SIX WHEELERS

VARNEY BROS., Inc.
Bellingham, Mass.
boosts loads with WHITES

WHETHER it's sand and gravel or ready-mix, Varney Bros. Sand & Gravel Co. have stepped up schedules with White Six-Wheelers. Operating costs are down, too!

It's the same story across the country. The big loads, the tough trips, the tight schedules go by White . . . and leaders everywhere report that Whites cut operating costs, boost profits.

Find out for yourself! Get facts from your White Representative . . . today!

THE WHITE MOTOR COMPANY
Cleveland 1, Ohio

MINIMUM MAINTENANCE— White Mustang Engines have plenty of power for outstanding performance, Donald A. Varney, president, reports.

"Whites assure us economical operation of our truck fleet," he says.

BIGGER LOADS— Treasurer Clarence E. Varney says this fleet of 19 Whites cuts costs . . . boosts deliveries. Bigger payloads important for more savings.

TWO MORE WHITES —Two more White Six-Wheelers have just been added to the Varney fleet to keep up with demands for concrete for construction according to Richard Varney, vice-president.

FLEET OF WHITES keeps rolling! Here is part of the Varney ready-mix fleet which operates in the heart of Massachusetts. Varney has boosted body capacities substantially and the Whites are rugged and ready to go with these bigger payloads.

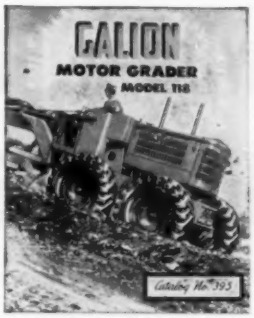
White

FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS

. . . for more details circle 247, page 16

INTERESTING LITERATURE on Construction Equipment

Free copies of these motor grader and roller catalogs are available to anyone having an interest in such equipment.



Model 118 tandem drive motor grader, 115 or 125 h.p. diesel engine.

Model 104 tandem drive motor grader, 100 h.p. diesel engine. Gasoline engine available.

Model 450 tandem drive motor grader, 75 h. p. diesel engine. Gasoline engine available.

Model 303 tandem drive motor grader, 55 h. p. diesel engine. Gasoline engine available.

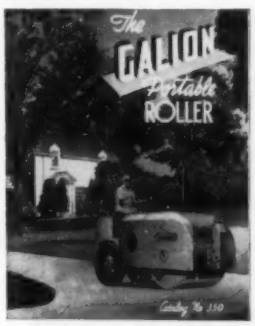
Model 503 tandem drive motor grader, 50 h.p. gasoline engine. Diesel engine available.

A trench roller especially designed for compacting materials on road widening jobs.

A 4-6 ton tandem roller with hydraulically retractable towing wheels for easy portability from job to job.

Tandem rollers with ROLL-O-MATIC torque converter drive. Four variable weight sizes. Gasoline engine. Gear shift models (without torque converter) available.

3-Wheel rollers. Five sizes with cast or variable weight steel rolls. Diesel or gasoline engine.



Portable roller. Variable weight. 7100-9765 lbs. Gasoline engine.

Small tandem roller, 3-5 ton variable weight. Gasoline engine.

ESTABLISHED GALION 1907

CHECK AND RETURN THIS COUPON TODAY FOR FREE COPIES

THE GALION IRON WORKS & MFG. COMPANY, Dept. RS-55, Galion, Ohio

I am interested in Galion equipment. Please send me literature checked below.

- ☐ 118 Motor Grader
- ☐ 104 Motor Grader
- ☐ 450 Motor Grader
- ☐ 303 Motor Grader
- ☐ 503 Motor Grader
- ☐ Trench Roller
- ☐ 4-6 Ton Retractable Wheel Tandem Roller
- ☐ ROLL-O-MATIC Tandem Rollers
- ☐ Three-Wheel Rollers
- ☐ Portable Roller
- ☐ 3-5 Ton Tandem Roller

NAME _____ POSITION _____

FIRM _____

ADDRESS _____

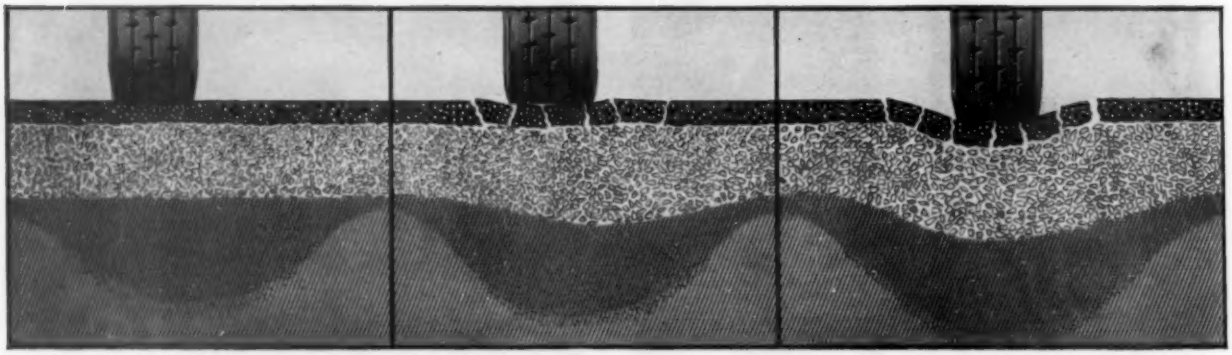
CITY _____ STATE _____

. . . for more details circle 189, page 16

Build YOUR Roads with a FOUNDATION . . . at low cost with a SEAMAN

Sub-grade soil stabilization with the SEAMAN MIXER is economical, quick and easy to do — and adds years and years of life to the base course. It cuts maintenance so sharply that the dollars budgeted for road repairs will pay for many miles of new and better highways.

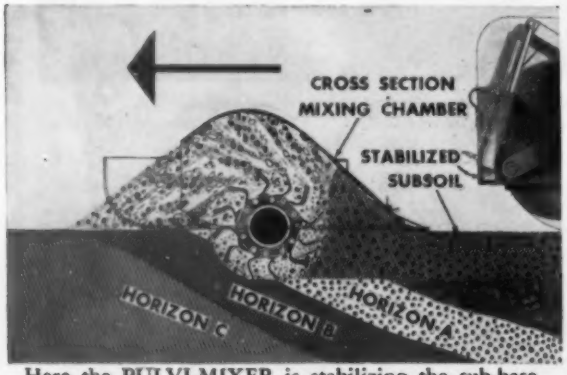
And, of course, if you up-grade the quality of your sub-base soil by mixing it with gravel or gravel and binder, your maintenance savings are proportionately larger and extend over an even greater number of years.



Sub-base failure is caused by soils of different natures reacting unevenly to moisture. Here a weak spot is developing in an *unstabilized* base. SEAMAN stabilization prevents this.

The breakdown of the soil in the sub-base through the disintegrating effect of moisture causes a localized movement and weakening in the base above.

As traffic pounds the base, cracks appear and the sub-base is weakened further by traffic loads and by permeation of additional moisture. The bridging effect of the base can no longer carry the load.



Here the PULVI-MIXER is stabilizing the sub-base by blending the different soils (soil horizons A,B,C) to attain a course which is uniform in moisture, density and thickness. Weak spots will not develop and the base above will withstand years of traffic punishment.

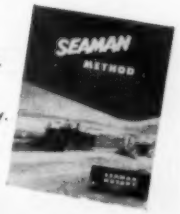
BLEND AND ASSEMBLE SUB-GRADE SOILS FOR MAXIMUM STRENGTH WITH THE SEAMAN

Sub-grade soils vary in physical characteristics and consequently in their reactions to moisture. It is their unequal movement and the presence of undesirable voids that cause heaving, pot-holing and breakup of the pavement. But one low cost pass with the SEAMAN blends and assembles those soils to uniformity in character and strength. This well-processed soil will reduce frost-boils, spring break-up and pavement failure.

that will support a wearing surface!

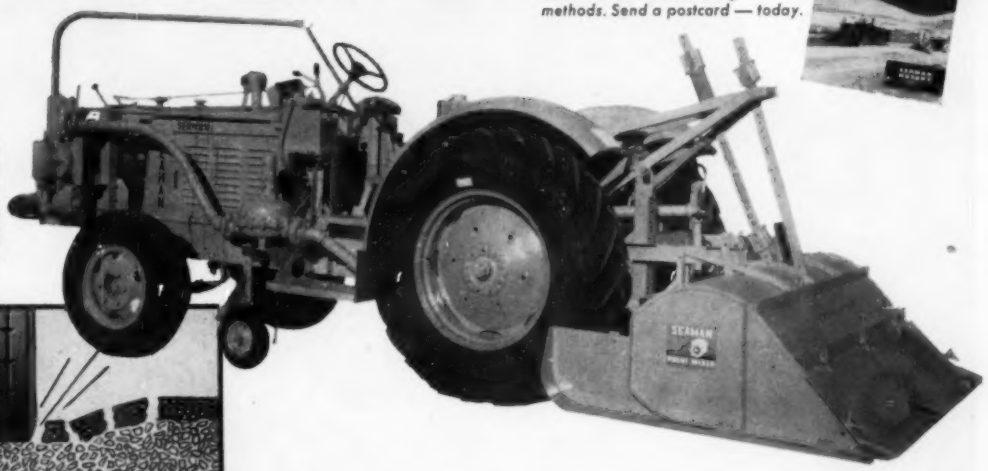
PULVI-MIXER

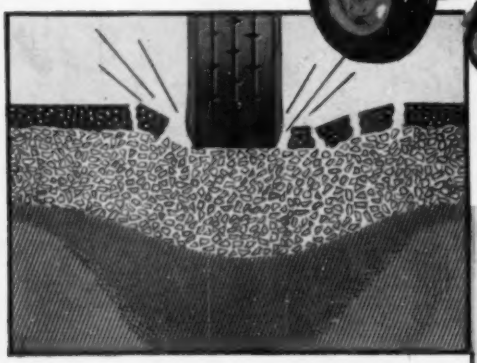
For a complete description of the SEAMAN TRAV-L-PLANT and the SEAMAN Self-Propelled PULVI-MIXER write for Bulletin TPS. It shows many field scenes and describes SEAMAN mixing methods. Send a postcard — today.



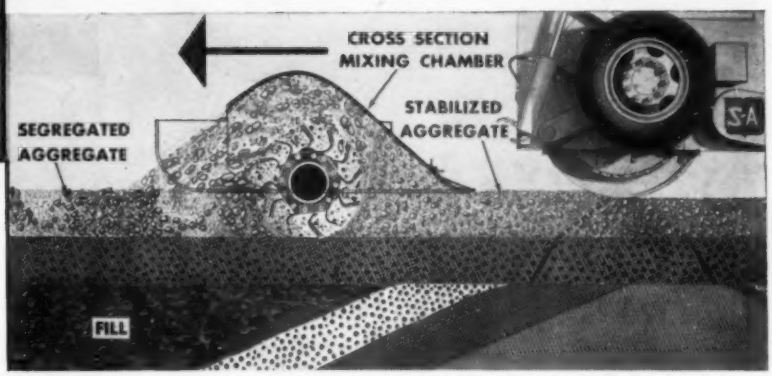
The Seaman TRAV-L-PLANT.

7 ft. mixing width; gasoline or diesel powered. Equipped with pump, tachometer assemblies, volumetric meter and spray bar for precision application of bitumen or water.





Complete breakdown of the base has started a chain reaction as more and more moisture permeates the fault and establishes repeated breakdown cycles along the width and length of the pavement.



. . . AND MIX THE BASE ITSELF WITH THE SEAMAN

No matter what materials — gravel, crushed stone, sand-clay, or native aggregates of any type; *no matter* what binders — bituminous, cement or chemical additives, — there is no equipment other than the SEAMAN that will blend, mix and assemble the materials so that the unstable segregation of coarse and fines is corrected. There is no other equipment that will so uniformly, quickly and completely distribute the binder throughout the mix. And SEAMAN-mixing costs are so low that only actual experience makes them entirely believable.

The SEAMAN PULVI-MIXER is processing the aggregates for the base course, correcting an always-present segregated condition — (the separation of coarse and fines). When the PULVI-MIXER has finished the work of blending and mixing the materials into a correct assembly, partially pre-compacted, the mix is ready for final rolling.

SEAMAN-ANDWALL CORPORATION

291 NORTH 25TH ST. • MILWAUKEE, WISCONSIN

7 important Dumptor advantages

Take another look at the latest model Koehring 6-yard Dumptor shown here. It has some important features worth checking. Notice how heavy snubber-spring on steering axle cushions road shocks — yet retains Dumptor's unique advantage of no spring maintenance. There are no leaf springs. Big shock-absorbing drive tires eliminate need for springs on the drive axle.

Alignment of drive wheels with steering wheels adds to efficiency of Dumptor no-turn shuttle hauling — makes a big difference in traction and flotation when Dumptor is shuttling back and forth across loose stockpiles, soft ground.

Another basic Dumptor advantage is instant gravity dump. It's controlled by a simple body latch and new dump lever arrangement. Gravity dumping eliminates slow-acting, troublesome body hoists — never balks, never wears out. Notice, too, the new streamlined, all-steel body. Even with all this heavy-duty strength, Dumptor still has more than 6 h.p. for every ton of loaded weight. It accelerates fast, pulls through soft ground and up grades with less shifting — climbs 24% grades fully loaded.

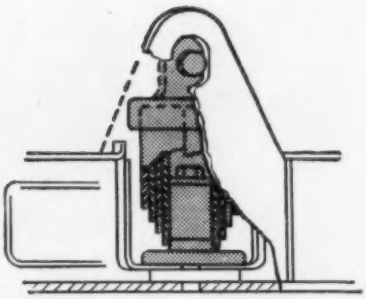
Let your Koehring Distributor give you all the latest Dumptor® facts. See him soon, or write.

KOEHRING COMPANY

MILWAUKEE 16, WISCONSIN

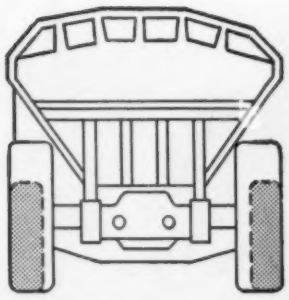
Subsidiaries: PARSONS • KWIK-MIX • JOHNSON

K437



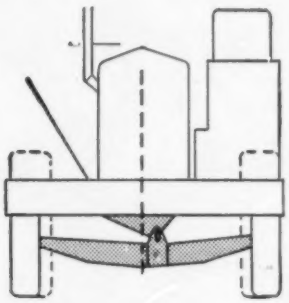
Smooth ride

Heavy, snubber-type spring is mounted between Dumptor main frame and the steering axle. Shock-absorbing action provides plenty of "cushion" — takes all the jolts out of rough, off-road travel. Easy on operator and machine.



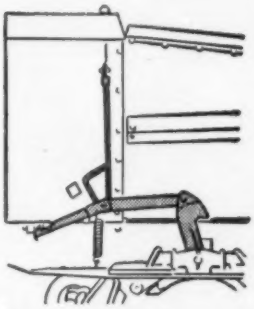
Tires track in direct line

Wider, heavier steering axle puts Dumptor steering wheels in direct line with big drive wheels. Tires track in the same path. There's less rolling resistance, better traction in soft ground, and on rough haul roads.



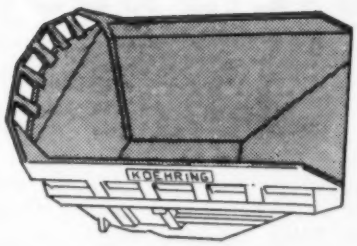
Off-set pivot on axle

Pivot point on steering axle is off-set from center line 3¼" toward operator side of machine. There's no sag, even with unbalanced load. Steering axle oscillates up to 21" — keeps twisting strains out of Dumptor main frame.



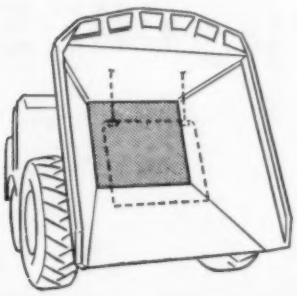
New body-latch, dump lever

Body latch for 1-second gravity dumping is simple, trouble-free. Latch is engaged by a single hook, mounted on the chassis frame. Dump lever is located inside the cab, in an easy-reach position to left of operator.



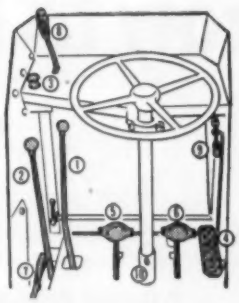
Streamlined, all-steel body

Inside is free of bulges or ledges. Top edge is box-beam constructed. Sides, ends are ribbed with 5 and 8" channels. Double-plate bottom is lined with multiple steel beams. Note ridge bar added to sturdy rock-guard teeth.



Bolted or free-swinging pan

Heavy steel kick-out pan is ½" thick. Pan can be bolted to body floor for extra protection when loading rock. Remove bolts, and pan has free swinging kick-out action — breaks suction when dumping wet or sticky materials.



Easy-reach controls:

(1) Speed gear shift lever, (2) directional gear shift lever, (3) starting aid, (4) foot throttle, (5) clutch pedal, (6) brake pedal, (7) parking brake, (8) body-release lever, (9) hand throttle, (10) running lights control switch.

. . . for more details circle 204, page 16

NEW YORK THRUWAY CONTRACTOR ORLANDO SHOWS . . .

how to keep your shovels busy

A. J. Orlando Contracting Co. of Whitestone, New York, won a sub-contract to excavate and move one million yards of earth and rock on the anchor end of the New York Thruway. The job had to be completed before snow and other winter conditions set in—and this meant fast stepping!

To keep cycle time down, dynamic Anthony Orlando set up schedules that would keep the shovels constantly busy with a minimum number of trucks. This was a job made to order for his fleet of Mack six-wheel dumpers, bolstered by five new Mack LJSW-X six-wheelers.

Despite heavy rains and unusually soft going, the contract was carried out at a rapid pace to a successful conclusion. Says President Orlando, "For jobs like this, Macks are the only trucks I can afford to operate."

Macks are the mainstays of many a contractor who must keep up fast and uninterrupted hauling schedules. The famous Mack Balanced Bogie provides sure-footed traction in soft or slippery going. And when it comes to shrugging off punishment, Macks are in a class by themselves.

Have your Mack branch or distributor show you why, like Mr. Orlando, you can't afford *not* to operate Macks.

MACK TRUCKS Empire State Building, New York 1, N. Y.

. . . for more details circle 218, page 16

ROAD LIFE UP

Why More Freeway Engineers Are Specifying SOIL-CEMENT BASE STABILIZATION

The cost of constructing and maintaining today's modern freeways must and can be kept down! They must be designed to take a heavy beating from traffic!

That's why more and more engineers are specifying soil-cement base stabilization. The result: tougher roads are being built and taxpayers' dollars are going farther.

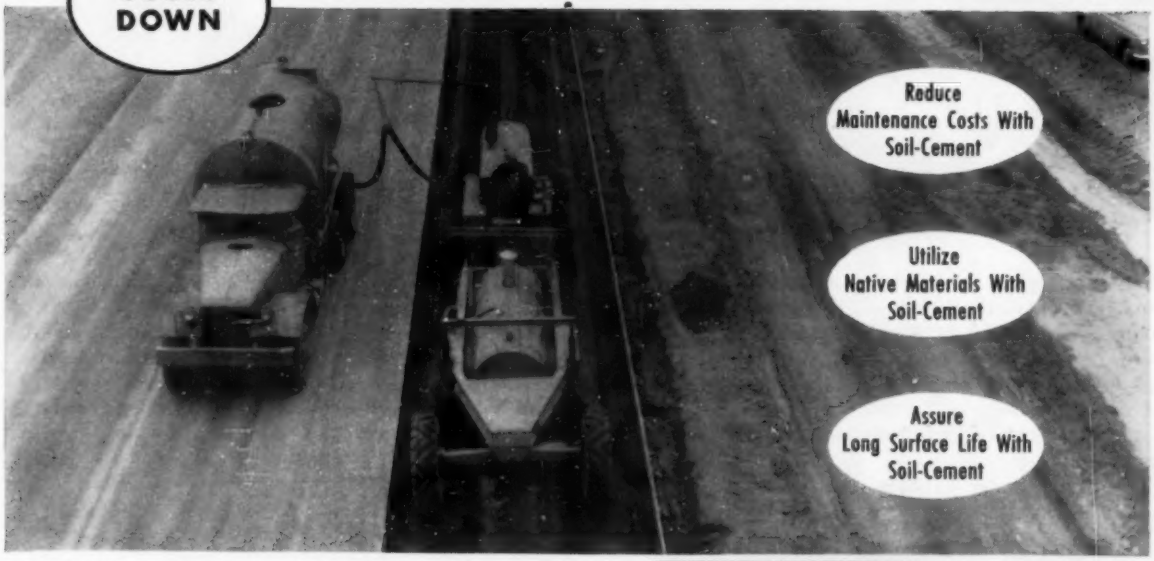
With soil-cement base stabilization, the base course can be made stronger—and often at a lower initial cost, since native minerals can be used.

Engineers are also looking to the future in their specifications. They know that soil-cement base stabilization will reduce normal maintenance and repair costs.

Let us send you case histories that demonstrate the advantages of specifying soil-cement base stabilization.

COSTS DOWN

Most Soil-Cement Is Mixed With Pettibone Wood Mixers



The Model 42 Pettibone Wood, Single-Pass, Self-Propelled Roadmixer, shown here in actual construction work on the freeway pictured above, produces 250 tons per hour of uniformly mixed windrows up to 6 cu. ft. ready for spreading. Tandem drive assures positive traction. Also available is the Single-Pass Model 54, which is tractor drawn and powered, with capacities up to 350 tons per hour.

. . . for more details circle 227, page 16

PETTIBONE WOOD MFG. CO.

Subsidiary of PETTIBONE MULLIKEN CORP., Chicago
6900 Tujunga Avenue, North Hollywood, California
Telephone: STanley 7-3281

PLAN NOW TO GET AN

Adams TraveLoader

Loading surplus ditch and shoulder material on a road job

Loading gravel from stockpile on a contract job

Loads with equal speed and efficiency from both windrows and stockpiles

For high-speed loading, at low cost—from either windrows or stockpiles—you'll find the *All-Purpose* Adams TraveLoader in a class by itself.

On road and street jobs, the TraveLoader picks up and loads surplus windrowed material — dirt, sod, scarified material, snow, etc.—at better than a truck-a-minute clip . . . and does it without interrupting regular flow of traffic.

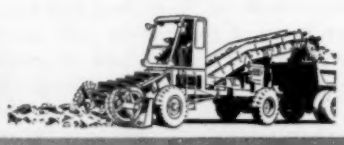
The TraveLoader handles stockpile loading with equal speed and efficiency, whatever the material—gravel, sand, crushed stone, slag, etc. . . . sends trucks on their way in jig time with full, well-balanced loads.

The TraveLoader's superior performance stems from a host of advanced features, such as **High-Speed, Full-Floating Feeder — Adjustable Conveyor — High, Centrally-Located Cab—Wide Range of Working Speeds.**

Ask your Adams dealer to show you how the TraveLoader will step up production and cut costs on your jobs.

ADAMS DIVISION • LeTourneau-Westinghouse Co., Indianapolis, Ind.

ADAMS



Motor Graders TraveLoaders Pull-Type Graders

LABOR SAVING METHODS AT IDAHO'S Sandpoint Bridge

By Louis F. Stirminski
Associate Editor of ROADS AND STREETS

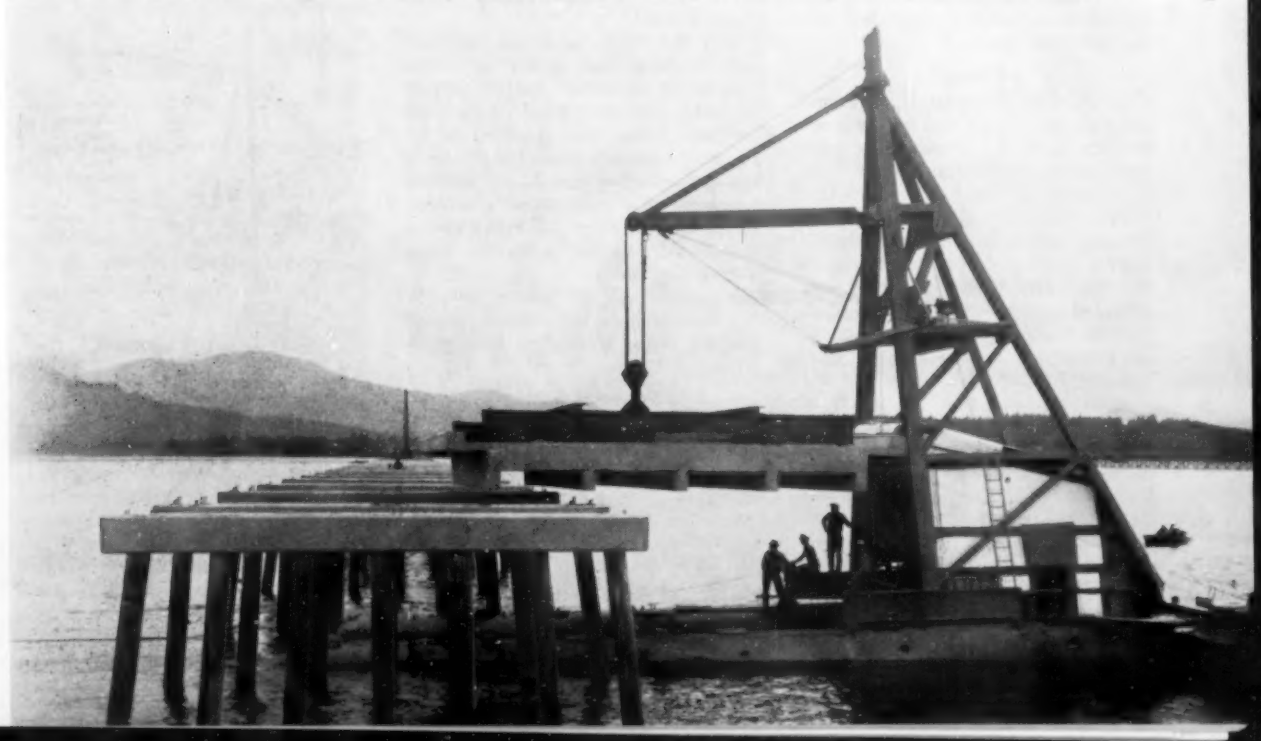
Precasting of deck slabs, bid under three alternates, speeded by efficient casting and handling methods. Long composite piles driven with aid of special splice and over-size ram.

A WELL-PLANNED and located casting yard and precasting of deck slabs as a unit are noteworthy features at Sandpoint, Idaho, where a 5,897-foot highway bridge is under construction over Pend Oreille Lake. The bridge also involving the driving of 1,130 piles is being built by Peter Kiewit Sons' Co. and LeBoeuf-Dougherty of Longview, Washington, under a low bid of $1,080,869.

Construction began in April, 1954, and anticipated completion date is August 31, 1955.

The bridge system consists of 154 basic spans at 35 ft. with each 6-span unit separated by a 17-ft. tower span of which there are 25. Except for an 82-ft. steel navigational span near the southern end, all spans are precast reinforced concrete of 5-stringer and slab section. Piling is 14-in. concrete-filled steel shell and 16-in. untreated timber in bents of 5, 6, and 7 piles each. Composite piles are specified for the northern two-thirds of the bridge and straight steel shell for the rest of the substruc-

● Moving and placing 70-ton precast deck slabs was done efficiently by a 100-ton jib crane mounted on pontoon work barge.



● Artist's conception of proposed bridge and approaches. New alignment is between existing railroad structure on left and present highway bridge on right of photo.

ture. Over-all deck slab width is 30½ ft. to give a 28-ft. wide roadway between curbs and 30 ft. clearance between rails. Longitudinal and transverse bracing are being installed only for the tower spans.

Piling

South End. Foundation investigations disclosed good soil on the south end for 2,000 ft., consisting of compact gravel substratum under variable depths of sand and clay. Test piles in this area confirmed that ample bearing could be obtained during driving, with piles approximately 76 ft. long. The design for this area provided concrete-filled steel shell piles in 5-pile bents, driven to formula bearing of 32 tons.

North End. Wash borings and soil samples revealed that for much of the northern two-thirds of the crossing the soil substratum is predominantly clay with a blanket layer of fine sand. Preliminary test piles driven to 75-ft. penetration gave high restarting and low bearing values. Additionally, 36-ton pile load tests resulted in excessive settlement. For these conditions, the design solution was long, composite piles in 7-pile bents, except for a short section where 6-pile bents would meet requirements and serve as a transition from 5-pile to 7-pile bents.

For the 7-pile bents, all piles are 128 ft. long and consist of 90-ft. lengths of untreated timber topped by 38-ft. concrete-filled steel shell sections. Piling was specified to be driven to grade, with 100-ft. minimum penetration and 22-ton formula bearing. This penetration provided for at least 10 ft. of soil cover giving the timber ample protection from rotting and decay. Piling in the 6-pile bents is also composite with 38-ft. steel shell and variable timber lengths, driven to formula bearing of 25 tons.

Pile Splice Modification

Originally, the splice design required lag screws to fasten the timber section to a 30-in. metal shell overlap. The contractor, however, eliminated the need for lag screws simply by welding a 2-in. cone-shaped ring to the bottom end, as sketched. In the driving of a composite section, this ring acted as a cutting edge, compressing the timber diameter to less than 14 in. and then allowing the timber to expand, when forced up into the 30-in. overlap. This wedging action produced an unusually strong and air-tight joint, thereby making lag screws unnecessary. Furthermore, the ring aided in keeping timber and steel shell vertically aligned at the start of driving. No pre-shaping of the timber pile butt was required, except as necessary to fit into the hammer. A ¾-in. metal "stop and driving" plate capped the overlap and kept the top of the metal shell water-tight for concrete filling. The slight but important adaptation of a cutting edge to the splice reduced substantially the field splicing costs.

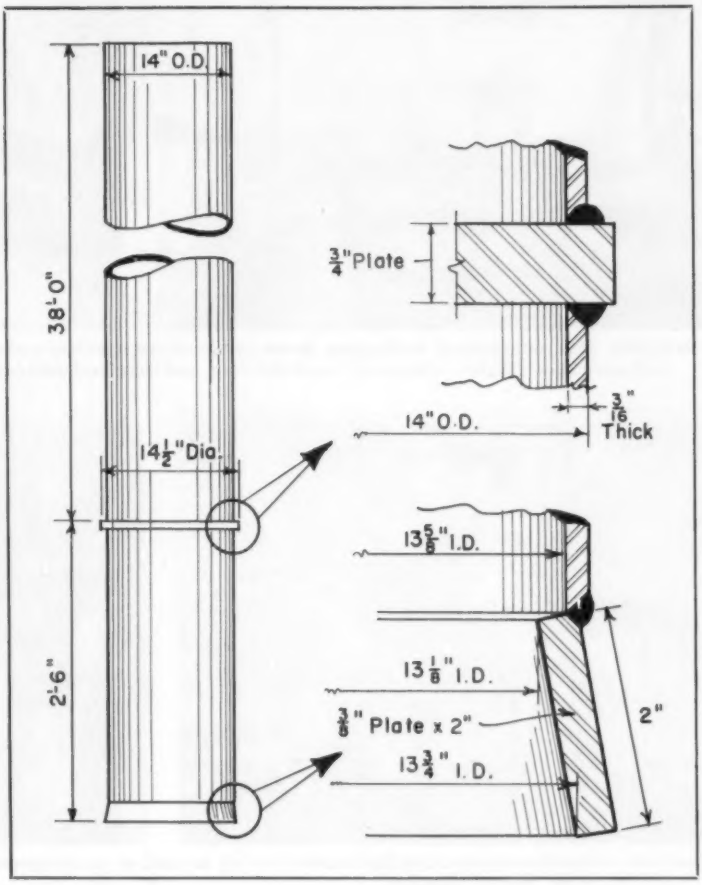
Pile Driving

Pile driving began on the north end, where shallow water might prevent placing of precast slabs by barge should a serious drop in the lake level occur. Driving continued for three-fifths of the bridge length before moving to the south end.

The pile driving sequence was the same for all bents: the center pile was driven first, as required by the engineers for control purposes; then the outside piles at 1⅛ to 12 batter; and lastly the remaining inner piles. Each pile was completely driven to required penetration or bearing before another was started. In composite pile sections, the bottom timber pile was first partially driven; the steel shell was then securely set and accurately aligned on the timber head, which

● Sketch map of new bridge location and surrounding features.

● Close-up view of pile driver. Here shown driving batter pile in bent next to a completed span. Note alignment control station set-up.



● Sketch of modified composite pile splice, showing 2-in. metal cutting edge added by contractor.

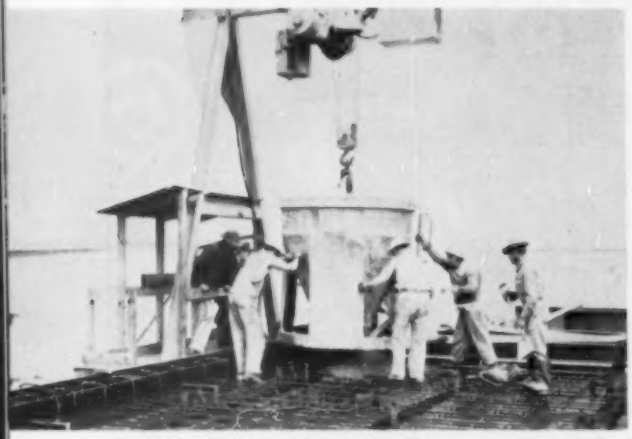
was always kept above water and the whole section completely driven as a unit.

As soon as a bent was completed, the shells were filled with concrete transported in two landing barges. Placing was done by a 3 cu. yd. concrete bucket and a barge-mounted derrick. This was followed by capping the bent with a 2x2x28 ft. reinforced concrete beam, also poured in place.

Pile driving production at the start was good and averaged 17 piles per 8-hour shift. However, upon hitting stiffening bottom layers of clay, driving time began to increase to 50 min. per pile. At this point, the contractor decided to use a heavier ram than the 5,000-lb. one in his Vulcan No. 1 pile hammer in order to get faster and better penetration with less rebound. A special 6,500-lb. ram was built and fitted into the hammer. Approximately 120 instead of 90 psi. steam was then required to lift the ram for driving piles. But the results were quickly noticeable, and more than offset the extra operating expense of the heavier ram. Substitution of the heavier ram cut pile driving time down from 50 to 15 min. per pile and production averaged 17 composite piles per day. In addition,

● View of pile driving barge with Vulcan No. 1 steam pile driver and 100-ft. leads driving piles for fender system of navigational span.

● (Left): 35-ft. rail-mounted steel gantry shown with 3 cu. yd. concrete bucket. In foreground is job-built iron jig for lifting slab steel assemblies. (Right): Close-up of metal slab form and completed steel being inspected before pouring.



● (Left): Typical bucket position for concrete pouring in front of gantry operator's enclosed platform. (Right): Vibration of concrete by Viber internal vibrators.

Step by Step: Precasting and Placing Operations

fiber cushion blocks on the hammer required less frequent replacement.

All the pile driving equipment was carried on one 30x70 ft. pontoon barge. The equipment consisted of the Vulcan No. 1 pile driver with 100-ft. hammer leads mounted on a 110-ft. driving frame, steam boiler, hoists, drums, and various accessories. Hammer leads and frame were built such that all piles in a bent could be driven at one barge location, thereby eliminating individual positioning for each pile.

Deck Precasting

Costwise, precasting has been the controlling and largest item in the contract. Its importance required and received careful planning and layout to assure economical and efficient slab production, as well as speedy erection in place.

Having the choice of selecting from three alternates, the contractor bid to precast an entire slab and set it in place as a unit. The other two alternates called for either precasting in sections, or a combination of precasting and pouring in place. Each alternate had certain advantages, but the one selected involved the least handling and the smallest number of sections.

As set up, all the precasting is done on the jobsite, concentrated on a 270-ft. pier built out from the south shore, and slightly upstream from the bridge site. The pile-bent structure is long enough to permit precasting one 17-ft. and four 35-ft. slabs at one time and also provide for easy movement and placement of slabs by barge. Truck discharge area for the transit-mix concrete is at the shore-end of the pier.

The key prime-moving rig selected to save time and labor is a 35-ft. railmounted steel gantry with a 10-ton P & H electric hoist. The gantry is electrically operated and runs the full length of the pier, for placing reinforcing steel and pouring concrete.

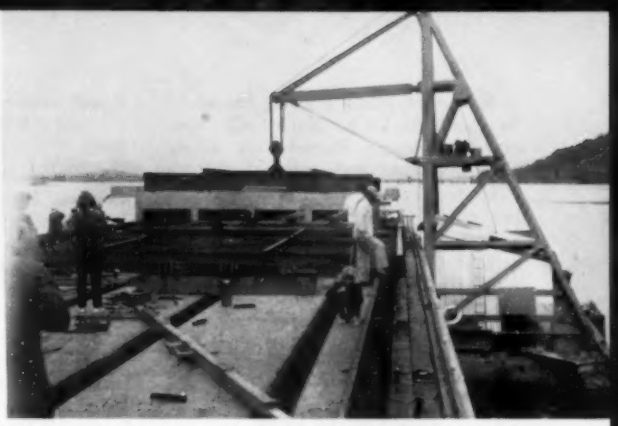
Major Quantities and Bid Prices

Sandpoint Bridge — Alt. No. 1

Item	*Unit*	*Quantity*	*Unit Price*
Concrete, Class A, precast	Cu. Yd.	5,430	$58.30
Concrete, Class A, poured-in-place	Cu. Yd.	1,198	58.30
Metal reinforcement	Lb.	1,475,429	0.105
Structural Steel	Lb.	226,000	0.23
Furnish Timber Piles, untreated	Lin. Ft.	72,800	0.95
Furnish Steel Shell Piles	Lin. Ft.	58,065	4.80

Total for Bridge	$1,080,869
Total for S. Approach	54,463
Total Contract Amount	$1,135,332

(Bid Opening: April, 1954)



● (Left): Long wooden float touching up slab surface behind Master finishing screed. (Right): A cured slab is easily lifted from well-oiled steel forms by special iron jig hooked to slab.

● (Left) Power tug towing work barge with slab suspended from jib crane to bridge site. (Right): Spacing of pontoons permits work barge to nuzzle between bents for accurate centering of slab.

# of 70-ton Deck Slabs for Sandpoint Bridge

Another time-saver has been the use of saturated steam for slab curing. It has cut slab curing time down to 48 hours to obtain specified strength of 3,000 psi. for the 1½ to 3 in. slump concrete.

The precasting begins on the shore and ends on the pier where the slabs are cured. From shore stockpiles, all reinforcing steel for a slab is sorted, laid out, and tied as a unit on wooden platforms. Hooked to a job-built iron jig, the entire steel assembly is lifted, moved, and set in a slab form by the gantry. All slab forms are strong and durable, built of 3/16-in. iron and shop fabricated for the job.

After a slab is poured, a 28-ft. Master vibrating-finishing screed strikes off and compacts the concrete. Touch-up finishing and floating are done by hand; internal vibration is by Viber vibrators.

Boxed in by plywood, the slabs are cured by saturated steam at 120° F. An oil-fired boiler at the shore-end of the pier feeds steam at 60 to 80 psi. into a 1½-in. main line running the length of the pier. From valve connections, two ¾-in. feeder lines distribute the steam through ¾-in. perforated holes in each of the 5 curing boxes. Steam curing can be 2-shift, 7-day operation when required.

Finished slabs are then lifted off the pier and transported out to the bridge bents by a barge specially designed for buoyancy and stability. It has two 8x60 ft. pontoons, spaced 12 ft. apart, to support an 18-ft. jib crane and derrick for lifting and placing a 70-ton slab without overtipping. Towed by a 125-hp. tug boat, the loaded barge is moved at about 1½ mph. When it reaches the site, it is carefully pulled into position by cables from the pile bents and an anchor, dropped opposite the span location.

When in place each precast slab is fastened to the pile-bent caps by anchor bolts to complete the erection. The anchor bolts are 1x15 in. size and run through two 6x6x⅜x19 in. clip angles attached to the middle and outside slab stringers.

Best weekly precasting production achieved to date by subcontractor, Seattle Concrete Pipe Co., has been 5½ slabs, using a total labor force of 2 iron workers, 2 boiler men, 1 finisher, 4 laborers, and 1 superintendent.

● Method of test loading piles with heavy concrete rings spliced together.

Steel shell piling is being furnished by Basalt Rock Co., Napa Calif. Specified minimum diameter is 14-in. with minimum wall thickness of 0.1793 in. throughout. Untreated timber piling is larch, locally procured, with minimum butt diameter of 16 in. and minimum tip diameter of 6 in.

The cement is high early strength, low alkaline for bent caps; and normal, type 2 for slabs and shell filling. Guard rails will be beam-type on steel posts.

Engineering Data

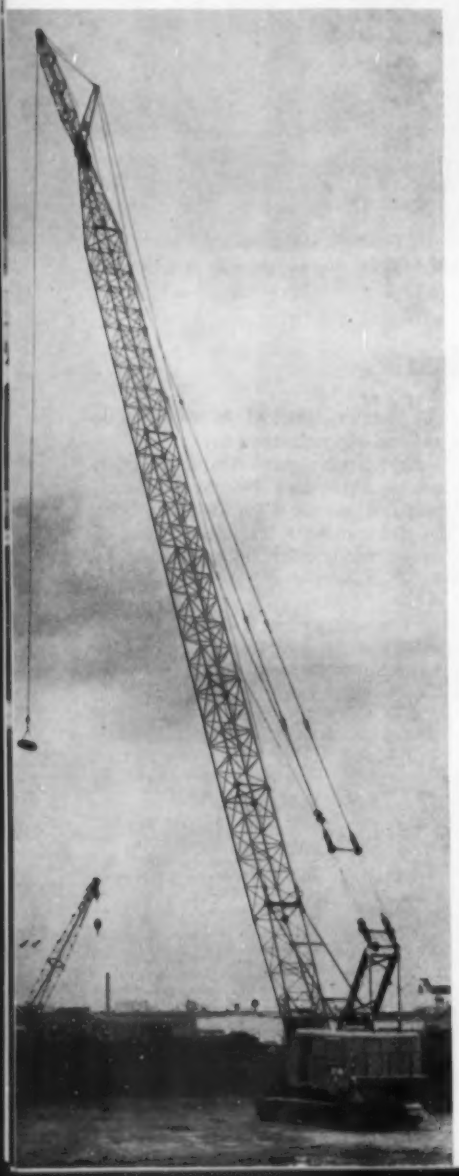
Selection of the new bridge site and type of structure was largely governed by foundation conditions and cost comparisons, as well as traffic studies in Sandpoint, the junction of U. S. 10-A, 2, and 95. The bridge is designed for an H15-S12-44 loading and according to AASHO specifications, 1953. The Bureau of Public Roads assisted in both the design and the cost studies of this federal aid project.

Its alignment closely parallels an existing 10,319-ft. untreated timber bridge, which will be subsequently demolished. Except for a 0.4 per cent longitudinal grade on the southerly one-third for approach and navigation requirements, the bridge is level and terminates at the north end on a 1.1-mile open-water hydraulic fill under construction by H. G. Palmberg Co. on another contract.

For survey and construction control, the highway department has effectively employed three Hallicrafter walkie-talkies and vehicle radios. A 500-watt Link transmitter and receiving set completes the communication net with the district office in Cour d'Alene, approximately 50 mi. away.

Job Personnel

Peter Kiewit Sons' Co. and LeBoeuf-Dougherty Contracting Co. are represented by J. Pierson, project superintendent, and D. K. Rodgers, project engineer; R. S. Simpson is superintendent for Seattle Concrete Pipe Co. For the Idaho Department of Highways, A. J. Sachse is senior resident engineer; R. M. Parsons, Cour d'Alene district engineer; and W. Albrethsen, state bridge engineer. The Idaho state highway engineer is E. V. Miller.



● Is this the longest boom?

Some boom — 230 ft.

What is believed to be the longest boom ever mounted on a crawler machine is shown in this picture of a P&H Model 955-ALC. There is 190 ft. of main boom and a 40-ft. jib, giving a total length of 230 ft.

This long boom machine handles a 1½-yd. concrete bucket on 190 ft. through a radius of 80 ft., or a 1-yd. concrete bucket on 230 ft. at a radius of 90 ft. The extra-long boom is constructed of welded alloy steel aircraft tubing. P&H friction-free Magnetorque swing (electro-magnetic type coupling) makes this possible. Operation was reported as effortless with no shock loading or snapping of the long boom structure.

This machine is one of three purchased by the Knickerbocker Construction Company of New York and is being used to pour concrete for a large low-rent housing project on New York's East River. The machines were sold by Construction Equipment Corp., Long Island City, N.Y.

Students offered highway opportunity

An opportunity for Pennsylvania college students of civil and mechanical engineering to acquire practical experience during the summer has been offered by State Secretary of Highways Joseph J. Lawler.

In a letter to heads of ten Pennsylvania engineering schools in March, Secretary Lawler outlined a plan which would provide employment for qualified students during the summer vacation.

While the program would be designed to attract sophomores and juniors, applications from graduates who intend to make highway work a career are also to be considered.

The job opportunities will be confined to residents of Pennsylvania and after selection by college officials, applicants will be interviewed by district engineers as to fitness for jobs. Only students with high grades will be considered for the summer jobs and the recommendations from the college officials would be the principal factor in placing the students.

"There is a definite need to attract more qualified technical employees into highway work," Secretary Lawler's letter declared. "With shortages in all branches of engineering, the State has lagged in recruiting and training competent engineers to carry on the tremendous highway construction and maintenance job which Pennsylvania needs.

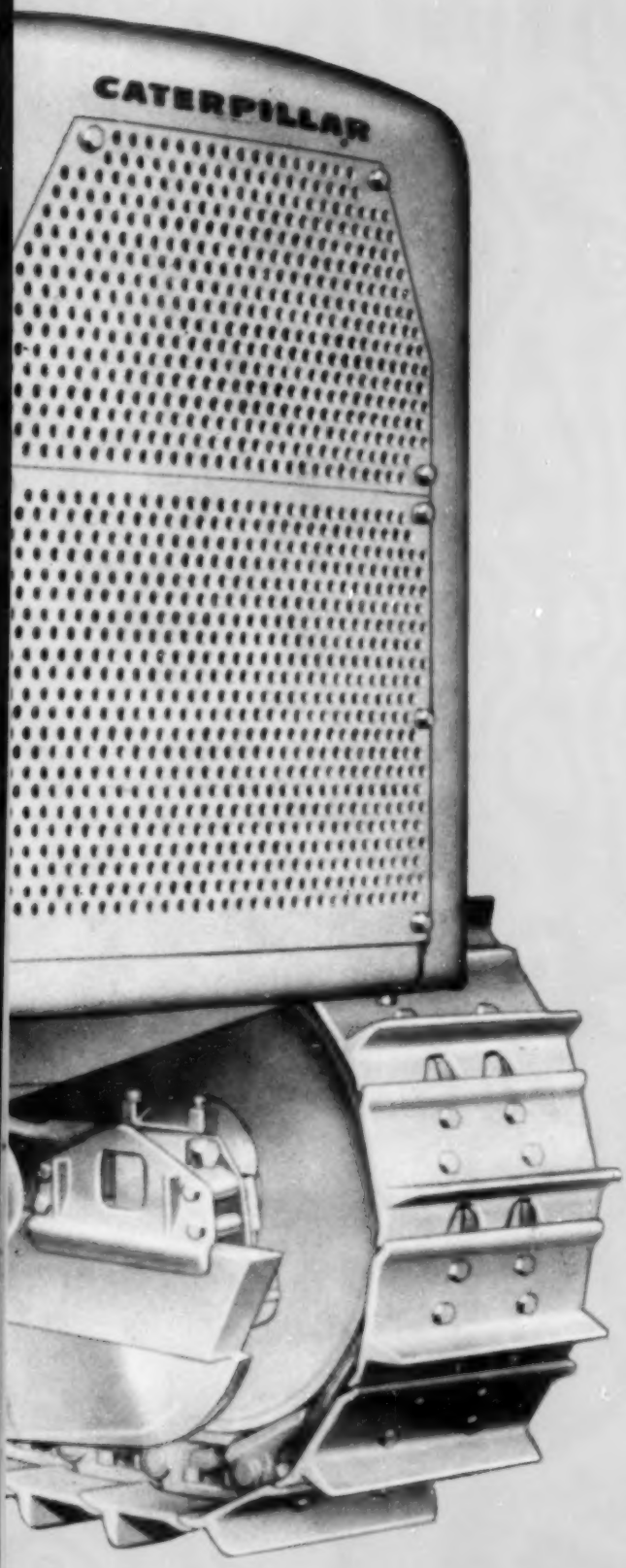
"Pennsylvania must be ready to participate in the Federal program for the construction of a super-highway system to take care of the increases in traffic, forecast in the next twenty years.

"Highway engineering offers an interesting, well paid career, and the prospects for increasing employment in this field are bright. By offering Pennsylvania engineering students a chance to work during summer vacation it may be possible for the State to establish a select reserve corps of future engineers."

Low bids in Ohio

Bids on 25 road projects all sizes in the Ohio Department of Highways program in February, totaled $4,120,860 for combined low bids against $5,013,300 for the combined engineers' estimates — 18% under estimates on the average.

Individual low bids were approximately 20% under in general, although as an extreme example of under bidding, one contractor took a job at $119,869 where the estimate was $194,300.



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(DRAWBAR)

56,200 LB.

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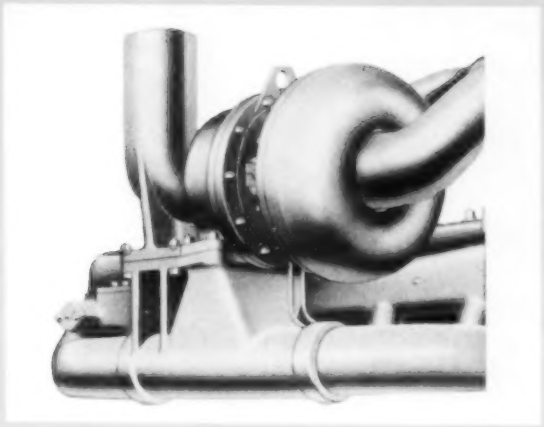
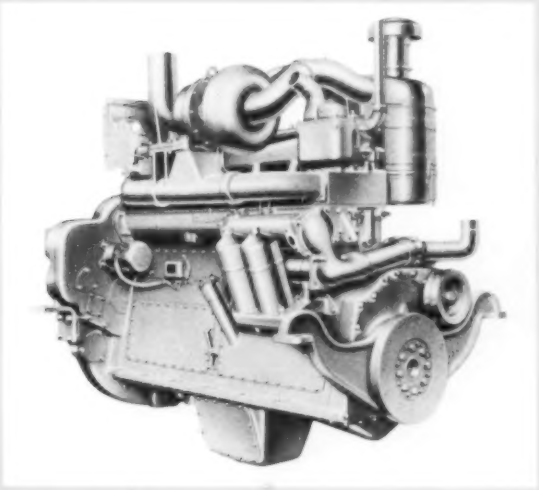


FIRST TRACK-TYPE TRACTOR WITH TURBOCHARGER!

The D9's new Turbocharger is driven by the engine exhaust, utilizing energy which would otherwise be lost. In addition, it packs air into the engine according to engine *load*, not speed. This means more working horsepower—greater performance.

CHOICE OF TORQUE CONVERTER OR DIRECT DRIVE!

Two types of drives are available, the exclusive Caterpillar oil clutch with six-speed (forward and reverse) transmission or a three-stage torque converter with 5:1 torque ratio. The transmission used with the torque converter has three speeds forward; two reverse. This option enablas you to match the drive you want to your job requirements.



COMPLETELY NEW 286-HP ENGINE!

In addition to the Turbocharger, the powerful new D9 Engine features a 6¼" bore and 8" stroke and runs at 1200 r.p.m. Long life and dependability are promoted by stationary oil jet piston cooling; short, rigid valve push rods give smooth, accurate valve action; "Hi-Electro" hardened gear at the rear of the crankshaft drives timing gears and accessories; and many other advanced features.

WIDE RANGE OF OPERATING SPEEDS!

TORQUE CONVERTER:

3 speeds forward, 0 to 4.1 m.p.h., 0 to 5.7 m.p.h., 0 to 7.8 m.p.h.
2 speeds reverse, 0 to 4.1 m.p.h., 0 to 7.8 m.p.h.

DIRECT DRIVE:

6 speeds forward, 1.6, 2.1, 2.9, 3.9, 5.0, 6.8 m.p.h.
6 speeds reverse, same.

CONSTANT-POWER DRIVE FOR REAR-MOUNTED EQUIPMENT!

You always have power for cable controls, direct from the engine's rear power take-off. This makes cable control operation completely independent of flywheel clutch or torque converter and gives you a big boost in operating efficiency.

The D9 . . .
proven in the field for a year!

Though new, the D9 is already a veteran. After exhaustive proving-ground tests, several D9s have been tested for over 19,128 hours on the toughest jobs in logging, construction, mining and quarry work. These jobs tested every square inch of this mighty new machine. The word from the field: "By far the best big tractor ever made."

Rugged—
and easy to service!

From its one-piece welded steering clutch case-frame assembly, to its track shoes hardened by the "Water Quench" process, the D9 is the toughest crawler built. And it's designed for easy servicing. Oil clutch, torque converter, transmission case and steering clutches can each be removed individually without disturbing other components. Hydraulic track adjusters are among the many other features for fast, easy adjustment and service work.

Brief specifications

Length: 17' 10¾"
Width: 9' 11¼"
Height: 8' 9"
Gauge: 90"
Weight: 54,000 lb. approx., dry
56,200 lb. approx., operating

Easy to operate!

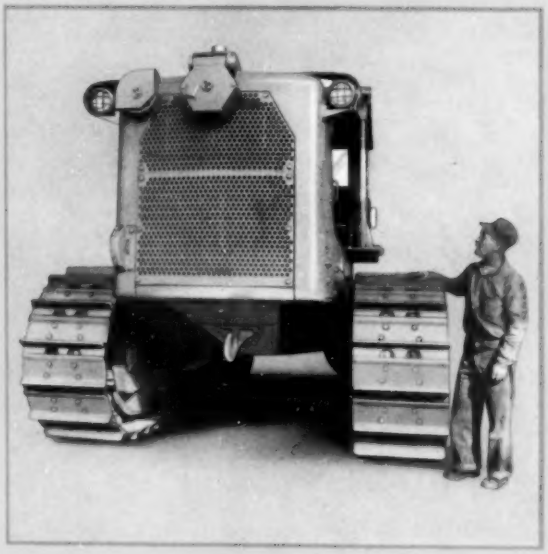
- The independent "live-shaft" drive for cable controls makes operation smoother, easier.
- Hydraulic boosters provide both power steering *and* power braking.
- Adjustable seat, all-around visibility, easy access to all controls make operator's job simpler.
- Important new 7-roller track frame improves stability, flotation and ride.
- New starting engine has electric starting system and simple single-lever control for easy operation from the seat and insures fast starts in all weather.

Equipment

New CAT*-built 'Dozers for the D9: the No. 9S Bulldozer, modified straight blade; the No. 9A Bulldozer, angling blade.

New Cat-built Cable Controls: the No. 29 rear-mounted, double drum; the No. 30 front-mounted, single drum.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



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EDITORIAL

Turnpike Safety Needs Continuing Study

Each passing year it becomes more clear that highway safety programs must begin with driver control. Without discounting for a minute the basic importance of building all possible safety into the highways, through modern geometric design and other engineering devices, the fact remains that even the finest highway can become a slaughterhouse unless the word is out that police are on the job.

Latest demonstration of the importance of driver enforcement and education lies in the annual report for 1954 of the Pennsylvania Turnpike Commission. For some years this road has had an alarmingly high accident rate, due, in the opinion of some observers, to a combination of too-narrow median, too-sharp curves in places, long driving distances, the 70-mile-per-hour limit, and the mingling of a huge volume of heavy commercial trailer traffic with passenger cars.

The state police, after accident studies, began cracking down harder than ever in 1954. The result was a 44 percent reduction in the fatality rate in a single year — down from 7.5 to 4.2 per hundred million vehicle miles. The injury rate was reduced 17%. The showing is credited largely to enforcement and education although the turnpike engineers have not neglected maintenance signing, marking, signals and other factors.

The fatality rate on the New Jersey Turnpike is down to about 2.5, and the rate for the New York Thruway in 1954 was 2.4. These roads too are closely policed and excessive speeds especially are being fought.

Studies by eastern turnpike officials show that a median must be as much as 60 ft. wide or wider before the accidents due to vehicles crossing the median out of control are entirely eliminated. Chief engineer Charles M. Noble of the New Jersey Turnpike is focusing attention on the rear-end collisions with trucks.

These are just a few among many safety aspects. As all the new turnpikes over the country get into service, more studies undoubtedly will be made to better determine accident prevention principles to guide the designer and the administrator. But the driver will continue to be the No. 1 problem.

How is Your Asphalt Mix Control?

The importance of skillful, vigilant, and unrelenting control effort in the operation of bituminous mixing plants is emphasized in a report issued for employees by the Minnesota Department of Highways.

This report by D. R. McFadden, bituminous engineer, in reviewing the large 1954 program of the department, presented a great deal of useful data on scores of projects totaling hundreds of miles and involving huge tonnages of mix as well as liquid asphaltic materials.

McFadden's discussion of bituminous plant operation by various contractors began with the following, "Studies conducted on mixes produced by each hot-mix plant indicate a greater variation in the asphalt content than anticipated." The report went on to note that 913 mixture samples were analyzed in the state laboratories, this analysis going beyond the routine information required on the field report sheets. "With very few exceptions it was found that all of the plants produced mixes having about same variation from recommended bituminous proportions."

Approximately 60% of the samples fell within the desired plus or minus 0.25 percentage points of the recommended bituminous content regardless of type of mixing plant used, proficiency of the operator, the quality of the inspection. Forty percent of the samples indicated a wider variation in content than desirable from the standpoint of laboratory design criteria.

This report is part of the effort of one of our best state highway departments to keep constantly on its toes. The report highlights a problem that is not special with any roadbuilding organization, but is common among them all. The inspection and control job on bituminous work must be constantly watched and every so often must be tightened up.

There are few better places to start to give the public a better money's worth for its highway dollar, and few places where extra care will pay off better in technical results.

● Could there be some relationship between the large number of contractor failures, and low bidding?

Dun and Bradstreet reports a 27% increase in contractor failures in 1954 over the previous year — largest number of failures since 1934. These came from firms of all sizes and presumably the 58% of failures that occurred in the under $25,000 class included home builders, etc. But 120 of the failing companies were in the $100,000 class in liabilities.

● Maintenance by contract takes an interesting new turn in the form of an invitation for bids by New Jersey Highway Authorities. Contractors were invited to bid on Garden State Parkway roadside activities consisting of mowing, weed control, placing top soil, and fertilizing and seeding the grass areas. This work which is part maintenance, apparently, and part completion of construction is handled in lengths varying from 15 to 39 miles, under the management of the maintenance districts set up for the Parkway.

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS

Roads and Streets in the News

21 states considering gasoline tax increases

Twenty-one states are considering proposals to increase gasoline tax rates, a study by the National Highway Users Conference reveals.

Effective March 1, Alabama's gas and diesel fuel tax went from 6c to 7c per gallon, with proceeds of the increase dedicated to retirement of a newly authorized highway construction bond issue. Final approval has been given to measures increasing North Dakota's fuel taxes from 5c to 6c per gallon; proceeds of the increase are earmarked for secondary roads. Montana's legislature has passed a bill to increase its gasoline tax from 6c to 7c per gallon for a two-year period commencing April 1, with proceeds to be used for matching Federal aid highway funds.

Other state legislatures considering proposed gasoline tax increases (with the present tax rate and proposed increase) are as follows:

Arizona*	(5c-6c)
Arkansas	(6½c-7½c)
Colorado	(6c-7c)
Connecticut	(4c-5c)
Indiana	(4c-6c)
Iowa	(5c-7c)
Kansas	(5c-6c)
Maine	(6c-7c)
Michigan*	(4½c-6c)
Mississippi	(7c-8c)
Nebraska	(6c-7c)
Nevada	(5½c-6c)
New York	(4c-6c)
Oregon	(6c-8c)
South Dakota*	(5c-6c)
Texas	(4c-6c)
Vermont	(5c-5½c)
West Virginia*	(5c-7c)

*(In states marked with an asterisk, bills have passed the House.)

Tax increases for motor fuels other than gasoline are being considered along with the gasoline tax proposals in the above states at the same or a higher rate than gasoline. Higher rates have been proposed in Iowa (6c-7c), Kansas (5c-6c), Michigan (6c-8c), New York (6c-9c), South Dakota (5c-7c), and Texas (6c-9c). An increase from 6c to 9c in Montana has been enacted to become effective April 1. A bill to increase the diesel fuel tax (but not gas) from 5c to 6c in Utah has passed the House.

Some states with part of their fuel tax rate on a temporary basis are being asked to extend such rates for additional periods. Already California has extended the 6c rate from July 1, 1955 (when it was scheduled to reduce to 5½c) until January 1, 1960. A 1c temporary tax in North Dakota, due to expire on retirement of certain highway bonds, was made permanent. Nebraska has extended its 6c rate from May 10, 1955 until May 9, 1959. Other states considering such extensions are Iowa, Kansas, Oklahoma, and Pennsylvania.

The U. S. House of Representatives has passed a bill (H.R. 4259) to extend the 2c rate of the Federal excise taxes on motor fuel for another year until April 1, 1956.

Expressways high on Mayor Daley's program

Chicago's new Democratic mayor, Richard J. Daley, issued an ambitious 20-point program for "better Chicago" following his election in April. His program includes the following:

- A search for funds to launch construction of much-needed cross-town subways and expressways. Funds will be sought in conferences with Gov. Stratton, state public works department officials and federal authorities.
- An emphatic statement that "mass transportation must be removed from streets into cross-town subways, elevated facilities and superhighway median strips." Daley added that "Chicago needs these outlets now; otherwise the city's commerce will be choked and strangled."
- He also proposes to set up a single authority for traffic-policing all streets and boulevards, now divided partly with the Chicago Park District.

Mayor-elect Daley, succeeds a regime under former Mayor Kennelly which has been heralded as one of the best in recent times in tangible progress on expressways, grade separations, off-street parking garages and other traffic aids. Expressway construction has moved slowly for lack of financing. State funds totaling $20 million yearly have been promised, but at this rate the expressways needed today will require 15 years to build. The Cook County Board and William J. Mortimer, Cook County Highway Superintendent, have proposed a $245 million bond issue to speed completion of Congress Expressway and connections to the northwest, southwest, and south.

Texas expressways not affected by turnpikes

The basic policy of how to plan toll roads in the midst of pending and current reconstruction of federal aid primary and interstate routes, is spotlighted by developments in Texas.

The Texas Highway Department is going ahead with an ambitious construction program, long since started, to create an expressway type facility along U. S. 77 and U. S. 75, south of the Dallas-Fort Worth area. These important north-south roads roughly parallel the location of proposed toll roads. Highway Commission Chairman E. H. Thornton, Jr., states that

● Automatic toll collector at the Raritan Toll Plaza near South Amboy, on the Garden State Parkway. It also photographs the license plates of those who try to "beat" the collector. Equipment being tried out experimentally. At the present time it is in operation until 3:00 P.M. daily. (Wide World photo)

"neither the announced intention of private companies to construct toll facilities in the approximate area of such highways, nor the actual building of toll facilities, will in any way result in a change of, or in a modification in, the commission's plans for U. S. 77 and U. S. 75." This announcement was clarified at the request of County Judge Milton Hartsfield of Ellis County, so as to help the county commissioners' court to formulate future plans and policies in connection with right-of-way for highways, toll or free.

Much of the right-of-way for the two U. S. routes has already been acquired and the highway commission has requested the various counties and cities through which these two highways run to acquire the balance of such land. Several million dollars has already been expended on construction, and for its current program the highway department has earmarked several million dollars additional. The Texas policy is to acquire right-of-way well in advance of construction to expedite planning.

There is much local speculation over the effect that four-lane divided highways with a high degree of access control will have on the earning power of toll roads built in their vicinity.

Roy Baker, president of the Sam Houston Turnpike Corporation, which proposes to build a toll road from Dallas to San Antonio, announces that the road "will be built." The first section will be between Dallas and Waco, ready at the end of 1956. Contract bids were to be invited at an early summer date, and meanwhile the firm is acquiring right-of-way and will let additional contracts for grubbing and top-soil removal soon.

A New York spokesman for Allen & Company, which along with Scherck Richter, Inc., of St. Louis, is managing the underwriting for a $46 million turnike bond issue said that "efforts were continuing to bring the offering to market as soon as possible."

Railroad 'piggyback' hauls competing with roads

Highway administrators are watching with mixed reactions the expansion of "piggyback" hauling by several railroads. This move, by which long-distance trailer loads are carried on flat cars instead of the highways, will bring revenue to the rail lines but will tend to cut the gasoline tax and truck fee revenue available for state highway work.

During March the Pennsylvania Railroad, after a small-scale test, moved into this type of hauling in a big way. The rail company in co-operation with Rail-Trailer Company, began regular schedules between Chicago, Philadelphia and New York City. Two fast trains, each consisting of 75-ft. flatcars of special design, began operation with a combined capacity of 200 trailers. Rail-Trailer Company is to provide terminal service.

Skyway Takes Shape in San Francisco

● Latest airview of San Francisco's most important expressway development to date — the elevated structure connecting the Bayshore freeway from the south with the downtown district and a by-pass around this district. The connection leading to the Bay bridge (at right in distance) will be completed this year. California Division of Highways is the agency. (Wide World Photos, Inc.)

New Parkway agency for Westchester County

The New York State Legislature passed and sent to the Governor, a bill to create a Westchester County Parkway Authority, as a step toward long-range solution to the serious traffic problems of this suburban area north of New York City.

One of the Authority's immediate responsibilities would be to finance a $35 million parkway reconstruction and expansion program. This would include rebuilding the famous Hutchinson River Parkway into a 6-lane limited access highway complete with interchanges. Also, reconstruction of the cross-country parkway.

This work would be financed by the pledge of toll revenues from the Westchester Parkway system, including receipts from gasoline and other service station concessions.

Contract prices down on turnpike jobs

Additional figures indicate the recent trend toward tighter bidding on the part of contractors. Latest is the report that the extension of 110 miles into the Scranton area, now under construction for the Pennsylvania Turnpike, was awarded at a total combined price of $121,300,353 as compared with an estimate of $146,876,000.

Also reflecting this trend, contract awards for the Delaware River Bridge to connect New Jersey and Pennsylvania Turnpikes have run 20% below estimates.

● Roadside improvement jobs were among those up for bids recently in the Pennsylvania state highway program. Previously this type of work was done by department maintenance employees. But in certain urban areas it has been decided to do the job, where feasible, by letting it on a competitive basis according to Secretary of Highways Joseph J. Lawler. The work advertised includes seeding, mulching, planting, and similar work for selected roadside areas in various counties.

Big Push Begins on Indiana Toll Road

SUBSTANTIAL construction progress is expected in 1955 on the 157-mile East-West Toll Road across Northern Indiana, connecting the Ohio Turnpike with the outskirts of Chicago. More than 87% of the project was under contract as of spring, and only 18 miles remained to be awarded near the western end in Lake County.

An indication of the speed with which Indiana's first toll road project has been organized and set in motion is revealed by a review of its history:

(1) Legislation for toll roads was passed on March 17, 1951.

(2) Constitutionality was established by Indiana Supreme Court on November 17, 1952.

(3) Recommended route approval came late in 1953, after economic feasibility was determined by location, traffic and earnings surveys.

(4) East-West Toll Road bond issue for $280 million was quickly approved and sold to private investment group on December 17, 1953. About the same time, the firm of J. E. Greiner Company was named as project's engineering consultant.

(5) Individual design-engineering contracts were drawn up and awarded for each of the 11 design sections, beginning in January, 1954.

(6) Eight months thereafter, the first construction contract was awarded for a 7.4-mile section on September 8, 1954, to Rieth-Riley Construction Co., Inc. The bulk of the project then placed under contract through subsequent weekly lettings continuing through later winter, 1955.

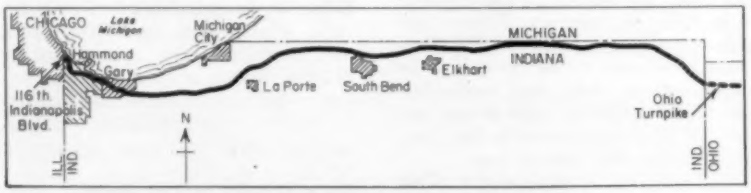
Recognizing the experiences others have had in contracting the work on such projects, the Indiana Toll Road Commission provided several means whereby construction progress and economies would be enhanced. First of all, the project was divided into 53 construction sections. Contractors were then permitted to bid on an individual section or a combination of sections as one contract. Additionally, grading, paving, drainage, and structures were lumped together so that one contractor would be responsible for all roadwork within his contract limits. By such bid alternates and package type contracts, it was believed that the work could be done at lower bid prices, as well as more efficiently than by other types of contracts. Whether because of intense competition or the package type of contracts, it is a fact, nevertheless, that low bids were averaging 27% below engineer estimates on the contracts awarded. Roadwork contracts have ranged in length from 2.5 to 14 miles.

The toll road design will reflect latest expressway standards. Right of way is 300 ft. wide, except in a few restricted areas. No upgrade will be greater than 2%, and no downgrade greater than 4%. Sodden median strips at least 56 ft. wide are provided in full-width right-of-way sections. The pavement system will consist of two 24-ft. p.c. concrete slabs of 10-in. thickness, with bituminous penetration shoulders. Eleven traffic interchanges, one at each end and the others spaced at intermediate locations, will control access and egress. Restaurant and service facilities will be centered in pairs at five locations.

Some Heavy Excavation

In the main, construction problems and methods will be generally similar to those on the western section of the Ohio Turnpike with some exceptions. Several elevated steel structures up to 4,000 ft. long will be built in heavily industrialized and populated Lake County. There will be a total of 11 major river and railroad crossings. Although the route crosses predominately level or gently rolling terrain, excavation and clearing will be heavy in a few sections. Deepest cut should not exceed 50 ft., but peat excavation is expected to be large in some marshy and low areas. Much of the grading undoubtedly will be done by scrapers, supplemented with draglines for peat excavation.

The toll road is being built by the Indiana Toll Road Commission, Albert J. Wedeking, executive director, and Herman D. Hartman, chief engineer. Consultant on the over-all project is the engineering firm of J. E. Greiner Co., which is responsible for co-ordination of design and construction supervision. Completion date of the toll road is scheduled as November 15, 1956.



● Linking Illinois and Ohio will be the Indiana East-West Toll Road.

● Beginning a stream bridge on the Indiana East-West Toll Road. S. J. Groves & Sons Company project, which was 22% completed as of April 15.

● A bill in the Maryland State Legislature (about to be passed at this writing) would require the State Roads Commission to foot the bill for relocation of publicly-owned water and sewer lines, caused by highway construction and repairs.

The State Roads Commission estimates that passage of this bill would add about $20 million to the cost of performing highway work in the currently planned program throughout the state.

LORAIN MC-425

NEW 25 TON MOTO-CRANE®

ANOTHER LEADER FROM THE LEADER

2 CARRIER WIDTHS

Now a 25-ton Moto-Crane with an overall width of only 96". Legal width in most states for over-the-road travel. Also available as Model MC-425W in 108" overall width for greater lifting capacities-on-rubber over the sides.

HIGHER CAPACITY TUBULAR BOOM

Square tubular chords and continuous tubular lacing increase strength and capacities yet reduce total weight in this quickly assembled, pin-connected boom. Plenty of capacity to travel with long booms over rear.

TILTING MAST GANTRY*

For easiest handling of long booms . . . tilts up or down as boom is raised or lowered to provide most efficient angle for boom hoist cable *at all times*. Standard 8-part boom hoist derricking gives slower, more precise boom control.

REMOVABLE COUNTERWEIGHT

Turntable and Carrier prepared for quick, easy counterweight removal. Reduces vehicle total weight for highway travel.

3-POSITION MOUNTING

Turntable mounting position can be selected to best fit the job and front end being used: (1) for proper clearances for shovel-hoe-dragline; (2) for general-purpose crane-clam application; (3) for 20 tons crane lifting capacity over rear on rubber.

DUAL REMOTE CONTROL*

Permits full air control from turntable cab of carrier engine throttle and clutch, carrier steering and air brakes, carrier travel at 1 speed forward or reverse. Quick, easy changeover from long range Moto-Crane travel to operator-controlled on-the-job localized travel.

*Extra Equipment

THE THEW SHOVEL CO., LORAIN, OHIO

It took a lot of rubber-tire crane "know-how" to build the MC-425 and MC-425W . . . to develop such big capacities at minimum weight and width . . . to provide so many operating and profit-making features . . . and Thew-Lorain alone has the vast experience that makes such advantages possible, due to the more than 35 years of rubber-tire experience they have acquired since originating the truck crane in 1918 . . . the leader still leads! The MC-425 and 425W are your proof.

SEE YOUR NEAREST THEW-LORAIN DISTRIBUTOR FOR THE NEWEST FACTS ON THE NEWEST LORAIN.

THEW LORAIN®

. . . for more details circle 238, page 16

"Tire costs below a mill-per-mile"

says Guy Cooper, Cooper-Jarrett, Motor Freight, Chicago

"In a multi-million mile operation like ours, a fraction of a mill-per-mile means real savings. Our most recent records show that U. S. Royal Fleetways have enabled us to keep our tire costs below a mill-per-mile..."

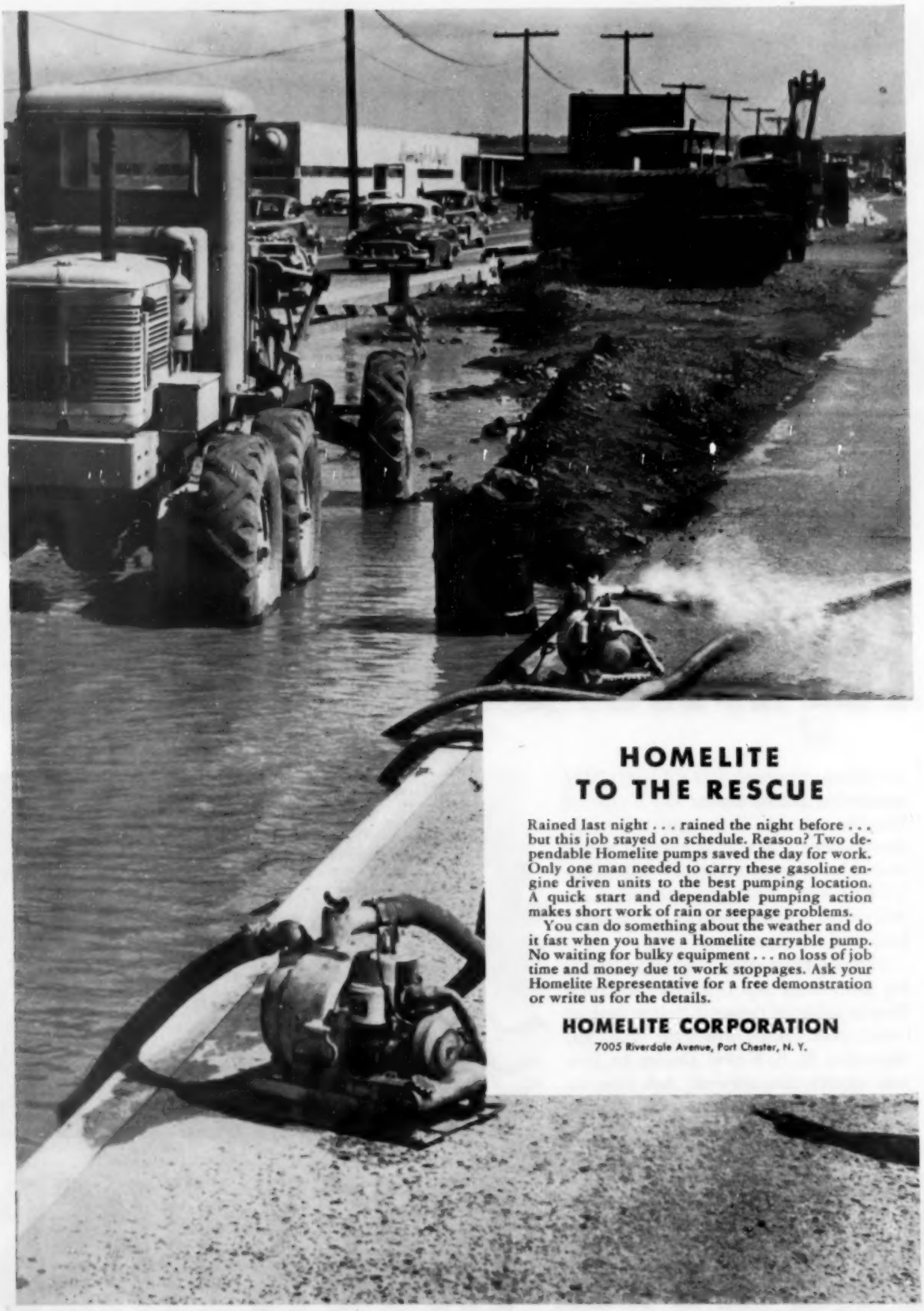
Far Lower Cost Per Mile!

cracking. Special ROYAL CORD processing pre-stretches the Nylon or Rayon, reducing "tire growth" while maintaining the cord's natural shock absorbing strength. Exclusive PYRAVIN bonding solution surrounds each individual cord—fortifies it against heat and friction.

Today—no matter what your trucking job—there is a U. S. Royal Truck Tire capable of doing it better and at lower cost. And wherever you go, there is a U. S. Royal Dealer to give you expert tire service. Ask him to show you *why* truckers report they're *well ahead* with U. S. Royal!

ROYAL TRUCK TIRES

. . . for more details circle 244, page 16



HOMELITE TO THE RESCUE

Rained last night . . . rained the night before . . . but this job stayed on schedule. Reason? Two dependable Homelite pumps saved the day for work. Only one man needed to carry these gasoline engine driven units to the best pumping location. A quick start and dependable pumping action makes short work of rain or seepage problems.

You can do something about the weather and do it fast when you have a Homelite carryable pump. No waiting for bulky equipment . . . no loss of job time and money due to work stoppages. Ask your Homelite Representative for a free demonstration or write us for the details.

HOMELITE CORPORATION

7005 Riverdale Avenue, Port Chester, N. Y.

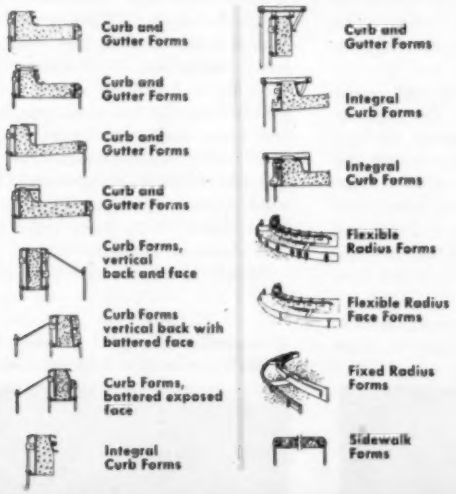
. . . for more details circle 198, page 16

Curb Service

THAT PAYS OFF IN EXTRA PROFIT!

The BLAW-KNOX *"Complete Package"* of STEEL UNIVERSAL STREET FORMS

meet *any* cross section requirements and *every* construction specification



Here's how you *save* money to *make* money on curb, gutter and sidewalk jobs! Blaw-Knox Steel Forms are *standardized* for interchangeability . . . use them in any combination to fit your job. You can use them over and over to save on costly material and expensive carpentry, especially for curved shapes. Blaw-Knox Forms are easy to set, strip and transport, and there's practically no maintenance!

Ask your Blaw-Knox distributor to explain all the other ways a "Complete Package" of forms will do a better job, faster, and at half the cost!

BLAW-KNOX

BLAW-KNOX COMPANY
CONSTRUCTION EQUIPMENT DIVISION
Pittsburgh 38, Pa.
Offices in Principal Cities

See your BLAW-KNOX distributor . . . ask about the "Complete Package" of concrete paving equipment

Blaw-Knox Aggregate Batching Plant

MultiFoote 34E DuoMix Concrete Paver

Blaw-Knox Finishing Machine and Concrete Spreader

Blaw-Knox Bulk Cement Batching Plant

. . . for more details circle 170, page 16

How Impact Wrenches Save Contractors Time in Field and Shop

● Foreman Karl E. Flemming, of "Central Penn." running nuts atop a section of 90-in. pipe.

Case examples reported from the operations of Central Pennsylvania Quarry, Stripping and Construction Company

HOW power impact wrenches can save time and labor for a road contractor is shown in the following case report. The report involves the Central Pennsylvania Quarry, Stripping and Construction Company of Hazelton, Pa., and has particular reference to a 4-mile road construction job built in 1954 on Route 126 near Breezewood, Pa.

(1) An outstanding example of time saving, estimated at nine days on installations of corrugated metal plate pipe, was accomplished by using an impact tool to run more than 12,000 nuts. The pipe in question consisted of 654 ft. of pipe for three culverts — one 78″ x324′, one 84″ x 194′, and one 90″ x 176′. In bolting the ¾-in. closely spaced nuts, a seven-man crew saved 504 man-hours over the estimated hand-wrench time. The wrench used was an I-R size 534 air driven Impactool.

With several men working inside the pipe and others on the outside, the holes in the overlapping sections were lined up by drifting before the bolts were inserted alternately from inside and outside. The nuts were then started by hand and tightened with the air tool. A portable compressor supplied the tool, which was used with equal facility in running nuts either inside or outside.

In field maintenance, the same tool helped the Central Pennsylvania crew speed up operations by limiting the down-time on equipment. Examples:

(2) Replacing the 10-ft. cutting edges on scrapers. This periodical job entails removal of 38 ¾-in. bolts. Using hand wrenches, two men normally take three hours or more; with the power tool, the job was completed in one hour, saving two valuable hours.

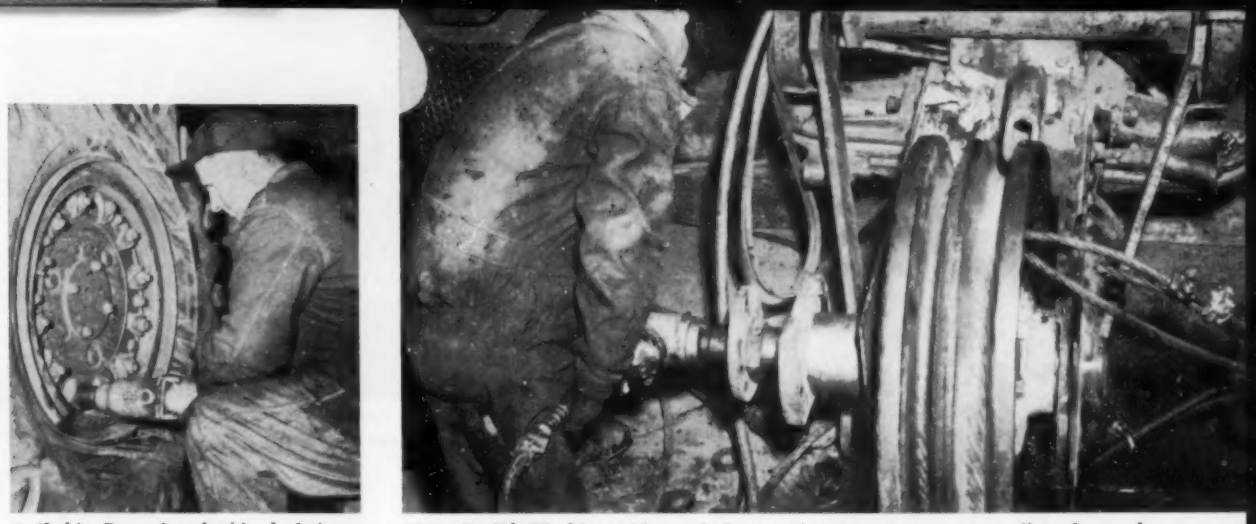
(3) Tightening track pad bolts. The four bolts securing each bulldozer track pad, which continually work loose, have to be very tight to prevent damage to pads.

In all, there are 50 pads on each

● Mechanic used I-R Impactool to remove securing bolts from 10-ft. cutting edge on a big scoop.

● Size 538 air Impactool being used to install new bottom plate on an 8 cu. yd. bucket.

● Removing a 1¼-in. securing bolt in hitch casting of a 6 cu. yd. bucket.



● (Left): Removing the big dual tires on a 35-ton Euclid. Working with an air Impactool, two men can remove all twelve mud-caked bolts and mount two new wheels. (Right): Impactool used to pull a pulley bushing into place at crane boom tip.

pair of tracks, representing 200 bolts for each bulldozer — a tedious job with a hand wrench. Just one tightening job for the contractor's full 35-dozer fleet involves several thousand bolts. On a straight nut-running assignment like this, the impact tool works as much as ten times faster than a hand wrench, reducing downtime for each unit to the barest minimum.

Speeding Tire Changes

(4) Tire changing on 22-ton Euclid end dumps. Using a power impact tool to run 11 nuts on each dual wheel, the men in the field found that they could change two wheels in the time it once took for one with a hand wrench.

Still other uses for the size 534 tool and other power wrenches:

(5) In the Company's Home Shop. In addition to the 35 bulldozers, Central Penn has 3 large draglines with 8-yd. buckets, 74 off-road trucks, some with twin diesel engines, and about 60 over-the-road trucks licensed for highway use. To maintain this equipment the company employs 35 mechanics, at its large Hazleton shop. Seven of the impact tools of various sizes are used in shop work.

Specifically, two of the shop tools, 4U electrics, are used on engine and transmission components, as wood screw-drivers, and for all jobs in which bolt size does not exceed ⅝ in. Three 34U electric units are for larger repair, maintenance and construction jobs in which nut and bolt size runs up to 1¼-in. thread diameter. One 534 air tool handles nuts and bolts of ⅝ to 1¼ in. size; and one size 538 air unit for sizes up to 1½-in.

Both the air and electric tools are used in the field as well as in the shop. In the field, the air tools get compressed air from engine-driven mobile compressors, while the electric tools are powered by generators on the big draglines.

(6) In miscellaneous out-of-the-ordinary applications. In replacing the lip of an 8-yd. dragline bucket, for example, a new manganese steel casting is set in place and then drawn tightly into position by 32 1¼-in. bolts on each side. These bolts are then removed one-by-one and hot rivets inserted in their place. Working with a hand wrench, it would take two men three days, or 42 man-hours, to complete a job like this. With the proper electric impact tool, or one of the big air tools, two men can complete the same job in 3½ hours, or 7 man-hours of labor. Time saving: 83 percent, or 35 man-hours on this one job alone.

(7) A somewhat similar, but more unusual, application is in the bending of 1-in. steel plate to conform with the lip curvature of an 8-yd. dragline bucket. The forward bucket section is a manganese steel casting and to it are welded and riveted the side, top and bottom plates. Replacing the top and sides is a comparatively simple operation, but replacing a worn bottom plate is a different story. This plate, 1 in. thick, must be bent to conform to the slightly curved shape of the lip, and it is here that the Impactool comes into the picture.

The first rebuilding step is to flame-cut the new bottom plate to size and grind the edges. The plate is then drilled for the rivet holes and placed in position against the lip. After it is secured in place with ¾-in. bolts at the center, where there will be no bending, the nuts are drawn up tight with the Impactool. Then, working on alternate sides away from the center, the mechanic puts in more and more bolts and draws them tight, using the tool's power to bend the heavy steel plate into position against the lip. The lip is 1½ in. thick at this point, bending is restricted to plate.

When the plate has been pulled into position, it is welded and the weld is heat treated. The bolts are then removed one-by-one and replaced with rivets. This is a hot riveting operation and is done with an air-operated riveting hammer.

(8) Ingenuity has developed still another tool use in the crane overhaul section — replacing the pulley bearing at the end of one of the big crane booms. This bushing is a press fit in the two arms that support the pulley, and because it is not feasible to take the long boom to a power press, the following procedure has been worked out.

The outer, press-fit diameter of the bushing is turned down to a slip-fit diameter for a short distance so that it can be started in the hole by hand. A threaded bar is put through the inner diameter, large washers are placed at each end and a nut is started by hand. The impact power of the tool is great enough to pull the bushing into position by tightening the nut.

Cost of winter maintenance

The 1953-54 winter maintenance season in Wisconsin was one of the least severe winters in over a decade; very little snow fell in the southern half of the state. As a result, the expenditures for snow removal, ice control and drift prevention amounted to only $2,216,358, or an average of $204 per mile of State Trunk Highway. The following is a distribution of these costs by activity:

Snow removal	$ 52.00 per mile
Ice Control	112.00 per mile
Drift Prevention	40.00 per mile

The average annual expenditure for the previous five-year period was $3,028,989, or $281 per mile:

Snow Removal	$134.00 per mile
Ice Control	110.00 per mile
Drift Prevention	37.00 per mile

HOW WOULD YOU DO IT?

One of a Series

1 On the Groves contract. Tough going in a wet undercut area. Tractor-drawn pans are getting through OK.

2 Same under cut area, as seen from other direction. Scraper operator ventured into trouble. First try, pictured here, was with first one then two tandem pushers. No go.

3 Two tractors up on dry ground with towing cables did the trick. All in the day's work. The rest of the hole was excavated with pushers, using two in tandem whenever needed.

WHEN a scraper with crawler tractor has to get down into a hole, the superintendent has to do some quick thinking. Is it too wet — perhaps wait a few hours for the sun to dry things out? Should we push load? Or better to use a snatch tractor, located up in the dry?

Such a situation was observed on two adjoining grading contracts on the Ohio Turnpike during 1954. In both instances bad spots had revealed themselves in the midst of the relatively shallow grading work, and the engineers had ordered sections to be undercut five feet or so and backfilled with granular material.

Pictures 1, 2 and 3 show the situation on the S. J. Groves & Sons Co. contract. The area to be trenched was about 30 ft. wide by 150 ft. long, and the clayey soil was wet and slippery, following a rain the night before. The company's Caterpillar DW21's, LeTourneau pans, Allis-Chalmers HD20's and Cat D8's took out several loads, then began to strike increasingly soft going. Finally one venturesome operator got bogged down. The first try was with two dozers in the hole, pushing in tandem. No good. Then the tractors both moved up front, where together they made good use of firmer footing by pulling the scraper out with ease, the snatch cable of the front tractor being threaded under the second tractor.

Picture 4 shows a somewhat similar situation on the contract of V. N. Holderman & Sons, Inc. Caterpillar equipment was involved. Here the soil was sandier, and not so wet. Tandem pushers helped get out excellent yardage.

4 Tandem pushers maintained high production on the adjoining V. N. Holderman contract, where the soil being undercut was sandier and the going less slippery.

THAT VERSATILE RIG.. THE PULLSHOVEL!

Northwest Pullshovel digging bell holes along with the trench.

Originally built for trench excavation the Northwest Pullshovel, because of its easy control, accuracy of handling and digging power, has been found efficient on a dozen and one jobs. Digging bell holes and basements, trimming banks—even grading road have all been found in the day's work of the Pullshovel.

Versatility like this means money in your pocket and often saves time that would be otherwise eaten up by converting to another type of boom. Ask for details about the Pullshovel. There is a size for your job.

NORTHWEST
ENGINEERING COMPANY
1504 Field Building
135 South LaSalle Street
Chicago 3, Illinois

Handling pipe for a gas line.

Left: Grading road—an unusual Pullshovel operation.

Right: Trimming bank on a bridge approach.

Above: Another bank trimming job.

Left: More and more Pullshovels are being used for basement excavation.

Right: Cleaning out small ore pockets in mining work.

NORTHWEST

CRAWLER and TRUCK MOUNTED SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

Contractors Optimistic Despite Competition

Associated General Contractor members told of prospects for another record year, but warned of need for business prudence as competition continues to sharpen.

A SPIRIT of conservative optimism for the immediate and long-range future of construction prevailed at the 36th annual convention of The Associated General Contractors of America held in New Orleans, March 14-17, 1955.

In addresses and committee discussions, division meetings and the convention sessions, these two points stood out:

- That construction is surging higher, with another record-breaking year — the tenth in succession — in prospect for 1955. And that the long-range outlook is for a continuing high rate of activity for years to come, due to huge backlogs of accumulated needs — especially in highways, schools, water and sewerage systems and other community facilities required by a growing population and rising standards of living.
- That competition among contractors, which has been increasing each year, is becoming still more intense, with bid prices dropping, the average number of bidders increasing, and many contracts being awarded on bids below engineers' estimates.

While the prospects for a sustained high level of construction activity in the foreseeable future engendered a wholesome optimism, the growing intensity of competition for the work coming on the market injected a firm and equally wholesome note of caution.

Business Prudence Urged

The general consensus seemed to be that the industry is inevitably going to take on more and more work, but it must exercise sound business prudence to see that this is not done at less and less return, to protect its own and the public's welfare in meeting the country's expanding construction needs.

Convention visitors had before them the results of the most recent AGC nationwide survey of conditions in the industry, conducted in February. A large majority of replies in the survey, covering prospects for the next six months, anticipated increases in all three major categories of construction — building, highway and heavy engineering activities — but said competition for contracts would be increasingly keen ("fierce"), with bid prices continuing to decrease.

The survey also indicated that material and equipment prices will remain comparatively stable during the next six months, but that there will be some continued tendency for wage rates to rise.

The convention installed new officers of the association, whose membership includes more than 6,500 leading contractors of the United States and Alaska, performing each year more than 80 percent of the nation's contract construction and a large volume of work abroad. George C. Koss, of the Koss Construction Co., Des Moines, took office as president.

The convention also (1) installed 24 newly elected national directors, who serve three-year terms; (2) seated national directors a portion of the total board membership of more than 80 being chosen each year; (3) saw the Board appointment of 33 members of the association's Advisory Board.

In his address as retiring president, John MacLeod, Macco Corp., Paramount, Calif., opened the convention with a report on AGC accomplishments during year and a call for further development of the association's "program for constructive leadership in the industry."

Referring to the construction industry as "a powerful force for the growth and development of America," and as "the nation's greatest single industrial activity," he said:

"The outlook for our industry this year is that, for the tenth consecutive year, we will establish another all-time record for the amount of construction put in place. The total volume of construction will account for about one dollar in each seven spent in the nation for goods and services, and will account for about 15 per cent of the jobs for the gainfully employed."

Annual AGC Report

In his annual report, Managing Director H. E. Foreman, of Washington, D. C., cited the all-time high construction volume of $52 billion in 1954, consisting of $37.2 billion in new facilities and $15 billion in main-

Highway Contractors Could Double Output

A. C. Clark, Deputy Commissioner for Engineering and Construction, Bureau of Public Roads (addressing the Highway Contractors' Division):

Surveys show highway contractors are ready to take on an enlarged road program without starting inflationary trends. Also that contractors "as an industry-wide average" are working at about half capacity.

Road equipment manufacturers are working at only part of their capacity and are "ready to support expansion."

An expanded highway program would call for a little over 4,000 additional engineers for each $1 billion of new work by current estimates.

A solution to the engineer problem may be found by attracting older engineers from other industries, using consultants, increasing engineer salaries and better utilizing available engineers.

● The AASHO-AGC Joint Cooperative Committee poses for its picture at New Orleans.

● Retiring President John MacLeod presents gavel to president-elect George C. Koss, as new vice-president, Frank J. Rooney of Miami looks on.

● Highway Division officers: M. Clare Miller, 1954 chairman, passes gavel to the new chairman, J. L. Ewell. At right is new vice-chairman, Edward O. Earl.

● D. G. Hansen (right), Logan, Kans., highway contractor, receives first-place safety award (best record below 200,000 man-hours) from G. W. James of T. L. James and Co., Inc., Ruston, La., a member of AGC's Accident Prevention Committee.

● A. A. Strane, Midwest PreCote Co., Kansas City (right), receives first-place award for safest record among highway firms working over 200,000 man-hours in 1954.

tenance and repair operations. Prospects are that the 1955 volume will approach $56 billion, he said. He predicted growth of the gross national product to $500 billion in 1965, as compared with current $360 billion in output of goods and services, bringing with it $75 in construction.

Pointing out that construction continued to increase in 1954, while economic activities in general were declining, he declared that "construction was one of the powerful factors which stabilized the transition period for industry generally and helped to avoid a serious recession."

Highway Contractors' Division

The Highway Contractors' Division under the chairmanship of M. Clare Miller, McPherson, Kans., thoroughly discussed a proposed ex-

(Continued on page 118)

WHAT CONCERNED AGC CONTRACTORS MOST

Resolutions passed at the New Orleans convention, translated by ROADS AND STREETS' *editors (we hope with fair accuracy) into man-on-the-street language.*

We Can Assure Money's Worth

To all public awarding agencies and private investors: The expanding construction industry has the capacity to carry out, promptly and efficiently, the great backlogs of construction needed of all types. Keen competition will assure you your money's worth, and your investment is safeguarded when you operate programs through regular industry channels and award public works jobs to the lowest responsible bidder after public advertisement.

We've Got the Capacity

We have the capacity to carry out the greatly expanded highway building program necessary to meet the nation's needs. We recommend administering this program through established channels of the Bureau of Public Roads and the state highway departments. Also that the contract method be used, with awards to lowest responsible bidder after advertisement, to safeguard public funds.

A Fair Shake for Labor

We recognize the necessity for cooperation between labor and management in our industry, in order to do the job efficiently, stabilize costs and hold costs in line with other services and commodities. Construction wages have risen commensurate with cost of living increases, and now that living costs are stabilized we recommend that the industry resist demands for increased wage rates and welfare benefits.

Davis-Bacon and 8-Hour Laws

On legislation to amend the Davis-Bacon Act and the 8-hour laws, (the convention) recommends: that the Davis-Bacon Act continue to be limited to federal construction contracts; that the findings of the Secretary of Labor continue to be limited to the prevailing hourly wage rates; that there be no extension of the Davis-Bacon Act or 8-hour laws, either directly or indirectly, to federally aided construction projects, such as federal-aid highway construction; that the basic American principle of judicial review be made applicable to the administration of the Davis-Bacon Act.

Safety in Construction

The conventions "commends the increasing number of member firms engaged in carefully planned programs for the safety of their workmen and the public, and recommends that all AGC members participate in the association's accident prevention program.

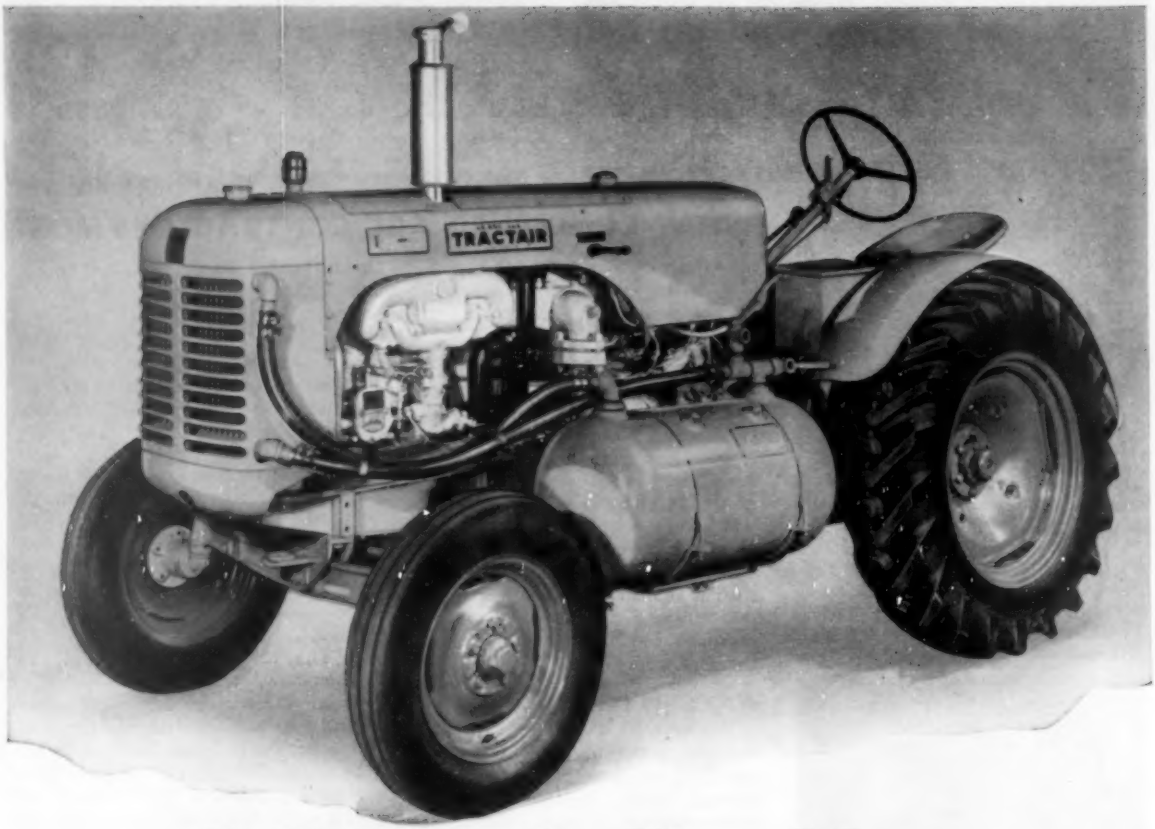
"The association has found that 'know-how,' sincerity, and pride of accomplishment by employers are essential to successful accident prevention programs. Since best results can be accomplished on a voluntary basis, federal legislation which would discourage initiative and force inefficient methods would be detrimental to effective safety programs."

Day Labor is Wasteful

"We strongly reaffirm our policy of opposing force account or day labor construction operations by any agencies of federal, state, municipal, or local governments. Force account methods:

- Do not adequately safeguard public funds, and comprehensive cost records are not open to the public inspection.
- Do not take advantage of the economy and quality of construction that are assured when public works contracts are awarded to the lowest responsible bidder after public advertisement among trained construction organizations.
- Complicate other construction projects by disrupting wage rates and working conditions established by collective bargaining between private construction management and labor.

The association commends restrictions on day labor and force account operations stipulated by Congress in appropriations for the Bureau of Reclamation, the Bonneville Power Administration, and the Alaskan road program, and recommends similar safeguards in appropriation for the Tennessee Valley Authority."



Still More for Your Money

...Le Roi Tractair compressed-air output is increased from 105 cfm to 125 cfm

For the past ten years, the Tractair unit has been making friends and cutting costs on jobs everywhere. Now, with its increased capacity, it is even more productive.

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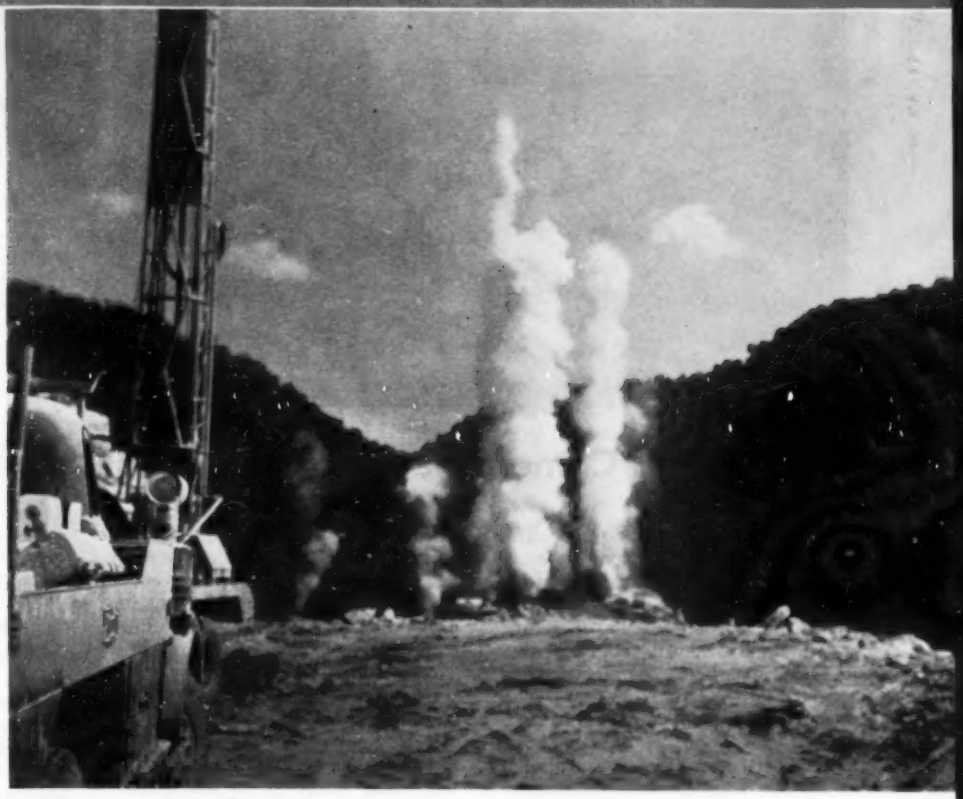
. . . for more details circle 208, page 16

Blasting in Road Construction



● One of many millisecond delay blasts that took place during construction of West Virginia Turnpike.

— With Special Reference to Millisecond Delay Techniques

How road contractors are capitalizing on the split-second delay method; advantages over instantaneous shooting; recommendations of explosives manufacturers. This report is based on field observations and on questionnaire replies from contractors over the nation

THE greatly increased tempo of expressway and turnpike programs is requiring constantly heavier blasting for excavation and grading to meet production deadlines.

Some recent road projects have required millions of pounds of explosives. The West Virginia Turnpike, for example, consumed more than 10,000,000 pounds in blasting cuts through its mountainous route. Even though crossing predominantly level terrain, the Ohio Turnpike had one rock cut over a mile long and up to 80 feet deep; 1,400,000 cu. yd.

Much of this blasting was by the millisecond delay method, which many progressive contractors have adopted with impressive results. Because of the results and benefits obtained, it has already been pronounced by many to be the most significant advance in the art and science in recent years.

In cognizance then of the growing, wide-spread applications being made of millisecond delay blasting, ROADS AND STREETS discerned the need for a comprehensive review of this method and how it benefits road construction.

From field trips throughout the country, personal interviews, questionnaires, and staff research, technical data on all aspects of millisecond firing in road construction were obtained and evaluated in detail.

ROADS AND STREETS presents here the up-to-date trends, techniques, and

A ROADS AND STREETS STAFF REPORT

● (Left): Explosive stress builds up in rock burden. (Photos courtesy Atlas Powder Co.)

● (Above): Full explosive power of blast acting on burden.

High-Speed Camera Sequence of a Millisecond Delay Blast

practices that are proving successful on actual jobs. In addition, there are included the latest recommendations of explosives makers and pertinent data from current blasting literature.

Admittedly, the subject of how best to shoot a particular rock cut by any method is a complex one, on which generalization sometimes even to a small degree is futile, as well as potentially dangerous if followed. But it is felt that what has been done safely by others warrants reporting and evaluating on specific as well as general terms. Furthermore, what governs the application of any method, and the opinions of experienced blasters and technical experts, merit publication to enable full dissemination of the data on this important development.

This review, of course, is not intended to be a definitive treatment, nor a formulation of criteria and procedure for applying millisecond blasting to one's own particular job. There are too many variables and factors inherent to every blast which must be recognized, considered and weighed in their own individual perspective. These generally over-rule the blind and religious application of procedures used elsewhere.

Unlike the quarry industry, contractors seldom find two rock cuts alike enough to standardize to any degree drilling patterns, working faces, explosives, and firing systems and sequences. Then, too, in quarries, blasting is done as a regular cycle of operations; rock formations being worked become well investigated, known, and tested by different shooting methods, until some degree of standardization is possible. For contractors, on the other hand, rock cuts and formations may change radically from one job to another, or even on the same job, requiring frequent improvisation, trial blasts, and adjustments in the whole blasting procedure. This is noticeable in the many variations of drilling patterns and firing systems in use on different construction projects throughout the country.

There are, in addition, contractors who blast rarely or so infrequently that no attempt is made toward following any particular procedure or practice. Others, on the other hand, do blast frequently and strongly favor certain practices and procedures for definite reasons. These include besides economic or technical evaluations, the particular work habits, experience, and training of their blasting crews. In the application of any method, and in particular millisecond delays, the many ramifications and variables that are common to construction, therefore, must be recognized and properly appreciated.

Acknowledgements

With respect to the explosives manufacturers, nothing in this review is intended in any way to detract from or give undue credit to any individual company for its part in the development and promotion of short-interval delay blasting devices, procedures, and methods. ROADS AND STREETS does wish to acknowledge certain data taken from Du Pont's "Blaster's Handbook" and various issues of Atlas' technical bulletin, "Better Blasting".

Because of the extensive experience of quarry operators with millisecond delays, some of their practices and experiences as reported by ROCK PRODUCTS* are given where considered applicable.

Theory and Advantages

Millisecond delay blasting is detonation of a number of charges at time intervals measured in thousandths of a second. By such split-second firing, stress in rock burden is built up progressively and rapidly, enabling full utilization of the explosive energy of all the charges for breakage and movement.

Much better fragmentation has resulted from this type of stress build-up even in the hardest types of rock. Secondary blasting has been substantially reduced, and in some cases made entirely unnecessary. There is more uniformity in the size of fragments, as well as the over-all shape, length, and width of the muck pile. Furthermore, toe conditions, backbreak, overbreak, slope shattering, and ribs between shots can be greatly curtailed by proper selection of time intervals and shooting procedures and patterns. Additionally, the amount and direction of throw can be controlled by varying the delay periods and intervals.

Probably the most outstanding advantage of millisecond delays is that more primary holes can be fired in a single blast with less vibration, concussion, and noise than by the instantaneous method. This feature alone makes it worthwhile in many applications where such effects must be

*Bror Nordberg, "How Producers Use Millisecond Delay Blasting," ROCK PRODUCTS, January and February, 1953.

● (Left): Gases and dust released after one second. (Right): Muck pile well displaced up slope.

kept at a minimum. One seismographic test, for example, showed that there was one-third the vibration from a 12-hole short-interval delay blast as compared with a 11-hole instantaneous blast using the same amount of explosives. In effect, it has meant an increase in the size of a shot where previously possible damages from vibration seriously restricted shots.

Aside from the above-mentioned advantages, this new method has given another means whereby adjustments can be made to trial shots to get the proper or desired effects from a blast. Simply by varying time intervals and sequence of firing, desired blast effects for some shots can be improved without altering drilling patterns, explosives, etc.

There are three different methods or devices for achieving a short-interval delay blast: millisecond (MS) delay electric cap, Primacord MS connector, or timing switch. Both the Primacord MS connector and timing switch are principally timing devices and each requires detonators, usually regular electric caps, to initiate a firing system. All three devices are herewith briefly described to outline their principal features and differences. Full descriptions and mechanical specifications are obtainable in manufacturers' catalogs and handbooks.

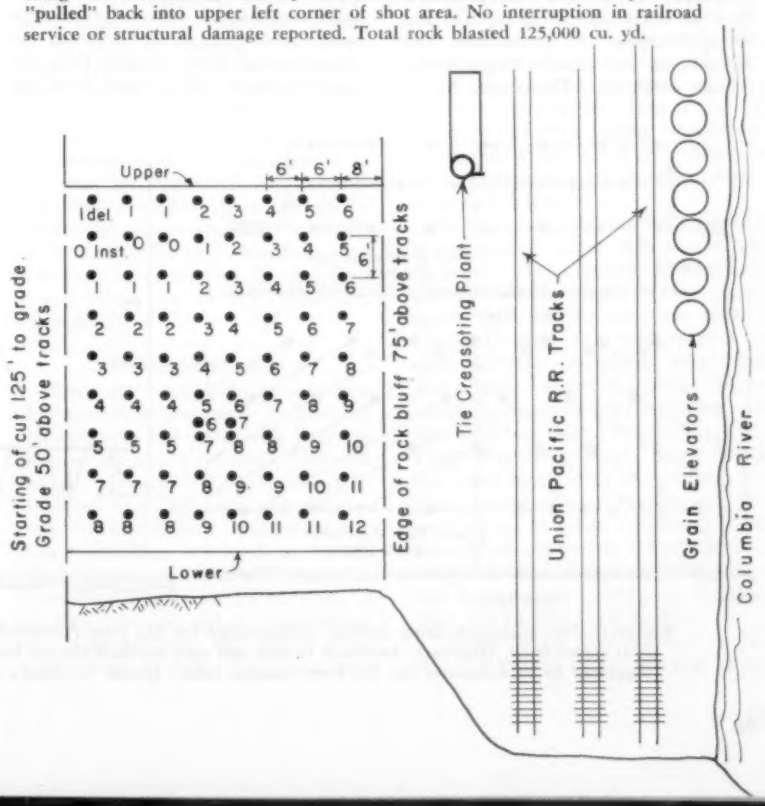
Millisecond Delay Electric Caps. The distinguishing feature of a millisecond delay electric cap is a special delay element which when activated by electric current delays detonation of the cap for a split second. In function, it is somewhat similar to regular delay caps, except the delay period is in terms of thousandths of a second rather than whole seconds. By variations of this delay element, these caps are built in a wide range of delay periods from 8 to 550 milliseconds. For convenience and safety purposes, each millisecond cap is designated by its delay period, and also by a detonator number. For example, the Atlas Rockmaster series has caps of 17 different consecutive delay periods, numbered as tabulated. Other manufacturers have their own series of millisecond delay caps which vary slightly in range and sequence of intervals, but all are essentially alike in principle and purpose.

Rockmaster Detonator No.	Delay Time After "Zero" (Average)
0 (Zero)	0 (Inst.)
1	8
2	25
3	50
4	75
5	100
6	125
7	150
8	175
9	200
10	250
11	300
12	350
13	400
14	450
15	500
16	550

● Sketch of firing pattern showing five rows of 20 holes each, loaded with Atlas Rockmaster series of millisecond electric caps of delay periods shown.

MS Primacord Connectors. The Du Pont Primacord MS connector is manufactured in only two delay periods, which are nominally 9 and 17 milliseconds. The connector is a 3¼ x ¼ in. copper tube enclosing a delay element and about 12 in. of primacord crimped into each end for tying into a Primacord firing system, between individual holes or rows of holes. For sequence firing in a single row, two connectors are usually placed in parallel between holes; whereas, in multiple row shooting when delays are by rows a recommended minimum of three connectors are used for each interval. For example, between two given rows there would be one connector at each end and one in the center of the primacord trunk line, as illustrated. MS

● Sketch of millisecond delay firing pattern used by an Oregon contractor for a difficult side-hill shot. Problem was to prevent damage from flying rock and vibration to railroad tracks, creosote plant, and concrete grain elevators. Delay firing was with MS electric caps for bottom hole detonation. Muck pile was "pulled" back into upper left corner of shot area. No interruption in railroad service or structural damage reported. Total rock blasted 125,000 cu. yd.



connectors are not placed in boreholes but lie on the surface of the ground. As previously noted, MS connectors require surface initiation of the firing system by regular electric caps or by other detonators.

Timing Switches. An entirely different means by which split-second delays can be effected is with a special electric timing switch, commonly known as a blasting timer. There are several different types, some on the market and others developed by individuals for their own operations. Each usually provides a choice of several delay intervals, but the number of circuits which can be connected is limited by the design and capacity of the timer. On the whole, the wiring layout is more complicated than that for millisecond electric caps. For safe and reliable operation, a dependable power source is an essential requirement for delay shooting with any type of timing switch. Usually, a firing system will consist of regular electric caps attached on the surface to primacord lines leading to boreholes for surface type initiation.

Selection of Method

Which method will best satisfy the requirements and objectives of a particular blast depends on many blasting variables, some independent and other interrelated. These include the type, quality, and structural characteristics of the rock formation, drilling pattern, powder factor, shot size and complexity, possible danger of premature explosions, and preferred type of initiation. Each method has its applications and limitations; also advantages and disadvantages under certain conditions. There may be instances when either method will prove satisfactory and then the choice will be dictated principally by relative costs or work habits of the contractor. While in other situations, one method and one method alone will satisfy the majority of the blasting requirements and objectives, in terms of breakage, throw, vibration, toe conditions, and safety. As a general rule, it is always good practice to solicit the advice of technical experts and representatives of explosives manufacturers before making the final selection. For those inexperienced in short-interval delay blasting, however, this should be a mandatory policy.

It cannot be overly emphasized that the selection of the proper method is of utmost importance. Every shot must be carefully considered by those responsible for the decision in the interest of blasting safety, efficiency, and economy.

Herewith are listed some of the key conditions which govern the application of each method, and also those that limit or preclude its use. The data, however, should not be construed as definitive criteria adaptable to every possible blasting operation. Nor should the interpretation be made that one method is being advocated in favor of another. It is merely a compilation of current blasting practice and basic recommendations of manufacturers' literature.

Selection Data

Among the contractors' methods surveyed and actually observed in the field, millisecond delay electric caps were more frequently selected for short-interval delay blasting than any other method. Jobs ranged from the east, to the midwest, and through the far west. The blasting was predominantly for cuts, both through and sidehill, in conglomerate, caliche, shale, sandstone, limestone, granite, and basalt.

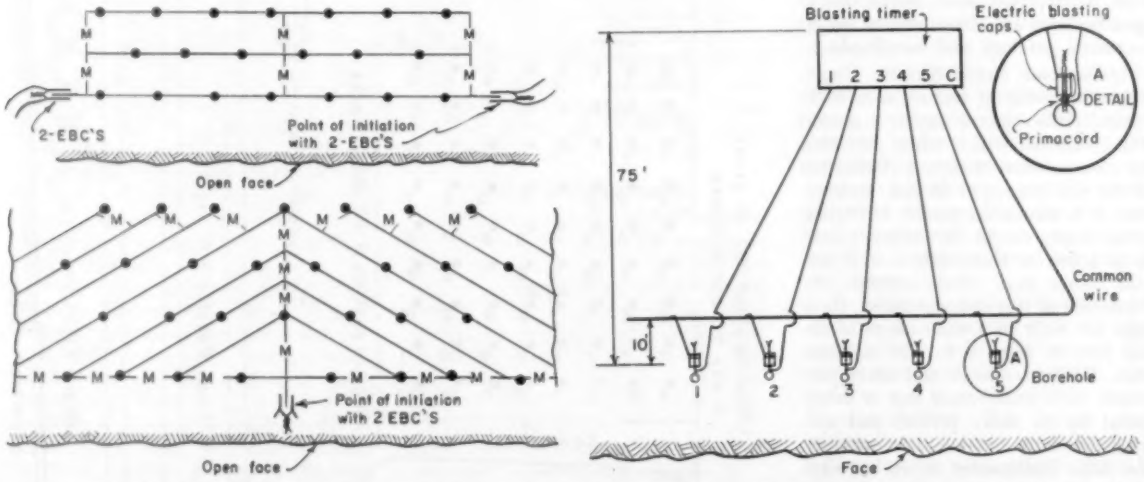
Whether the predilection by this sample group for millisecond delay electric caps can be interpreted or projected to mean industry-wide preference is a moot question and of no particular consequence to the basic purpose of this review. In this limited survey no attempt was made to arrive at the mean or average blasting operation, if indeed such exists.

The principal reason given for selecting millisecond delay electric caps was the decided preference for bottom hole type detonation. It was felt that this gave better bottom pull, greater confinement of gases, and a higher degree of fragmentation. The results reported confirmed several other noteworthy and significant data.

It is an extremely flexible method and can be adapted for shooting with good results in diverse drilling patterns and rock formations. No undue difficulties or labor were reported in wiring, hook-ups, and firing.

Although predominantly set near the bottom, millisecond delay electric caps can be placed anywhere in the borehole. Top hole detonation gave satisfactory results in one limestone cut where vibration was a problem because of proximity of a built-up area. In another case, two caps of the same delay period were placed in a deep borehole, one near the bottom and the other near the surface, with both connected by primacord as an added safety measure.

Most technical literature is in agree-



● (Left): Two multi-row firing layouts recommended for Du Pont Primacord MS connectors. (Top): Initiation is at center front. (Bottom): Initiation at each end with standard electric blasting caps. (Right): Wiring layout suggested by manufacturer for Du Pont blasting timer. (From Du Pont's "Blaster's Handbook.")

● Millisecond delay blast for New York Thruway in built-up section with shot area less than 75 ft. away. (Upper left): View of rock cut and surrounding area. (Right): Control of throw shown at peak of blast. (Lower left): Muck pile after blast. (See Case 7 for complete shot details.)

ment that millisecond delay electric caps in boreholes are the safest devices for a closely spaced pattern with small sized boreholes, such as are drilled by wagon-drills. MS connectors or blasting timers in a primacord system with surface initiation is prohibitively dangerous in such a pattern because of possible cut-offs or misfires from ground movement.

What generally precludes the use of millisecond delay caps are those conditions which would preclude the use of any type of electric cap in a borehole; namely extraneous electricity, static electricity, and wet ground. Under these conditions, primacord initiation in boreholes and Primacord MS connectors on the surface are virtually insensitive to electricity and water, and, therefore, are recommended.

MS connectors also are strongly supported by those who believe that surface initiation with a Primacord system is the safest and best means of accomplishing a short-interval delay blast where the drilling pattern features large size or rotary drilled boreholes at wide spacings, usually more than 10 ft.

There are other situations where it may be more desirable to use Primacord and MS connectors than millisecond delay caps. One is in deck-loaded charges for safety and speed in placing the explosive and stemming, especially when boreholes are poorly drilled. Another is when delay intervals of 9 or 17 milliseconds are satisfactory for blasting requirements, and Primacord layout is more practicable and suitable.

Timing switches although less favored in roadwork are still the only means for providing precise delay intervals where this is an essential requirement. Although wiring and connections are somewhat more complicated than for other methods, it may be the most economical for shooting relatively few holes of shallow depth, according to some operators. If surface initiation and a Primacord system of firing are desired at intervals other than 9 or 17 milliseconds as provided by Primacord MS connectors, then a blasting timer should be considered. However, delay intervals of 26 and/or 34 milliseconds can be provided by connecting in tandem a 9 and 17 or two 17 MS connectors, respectively.

Delay Intervals

There are no specific criteria that will prescribe accurately beforehand the optimum delay intervals between rows of holes for a particular shot and set of job conditions. It is highly problematical that any such criteria can ever be established because of the many variables involved in every blast. There are, however, certain relationships which can be set forth in general terms to aid in determining or narrowing down the choice of intervals. As a rule, the surest and quickest method of determining proper intervals to obtain optimum results will be by trial shots and by applying judiciously the experience learned from blasting in similar rock formations and patterns.

To illustrate the wide range of thinking, some experts insist that delay intervals from 15 to 20 milliseconds are generally satisfactory; whereas, others maintain that a longer delay from 25 to 30 milliseconds will usually give better breakage and least vibration. Actually, no trend was detected in construction shots for either of those intervals, since contractors employed widely divergent intervals to fit their particular shooting conditions and problems.

In the main, shorter intervals are recommended when initiation is at the top or at the surface, to minimize cut-offs and for greater throw. Fragmentation and vibration are closely related to each other with respect to delay intervals. A widely recognized and accepted theory is that the delays which produce the least vibration will also give the best fragmentation. Fragmentation will vary, however, if the differences in delay periods are great; vibration may or may not, depending on the shot conditions. The amount of explosives set off at one time and the number of delay intervals have greater bearing on vibration than the interval time length.

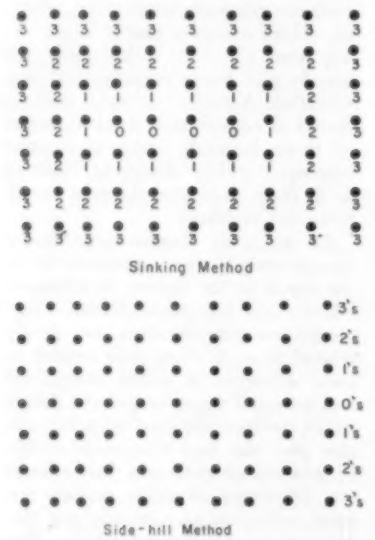
Compounding this problem of interval selection is the reaction effect

of rock under explosive stress. That delay interval which is best for breakage may result in undesirably fast rock movement, necessitating a shorter delay interval even though breakage will be poorer. If there are prominent and deep cleavage planes, massive rock strata may tend to break into large blocks, thereby requiring much secondary blasting. Altering the delay interval alone may or may not give better breakage, but certainly merits consideration, as it is a simple means for obtaining a quick shooting adjustment.

Other factors such as drilling pattern, type and amount of explosives, firing sequence, are other important variables which in certain instances may have more effect on blasting results than minor variances on intervals.

Additionally, some contractors have found that not one but several delay intervals for a given drill pattern are the most effective. One contractor, for example, in shooting a through cut in a massive, columnar basalt formation had satisfactory breakage with 0-100-300-500 delay periods from centerline to slope lines, respectively. Just what is the relationship between borehole row spacing for varying intervals has not been formulated.

It should be borne in mind that Primacord MS connectors give only two delay intervals, normally 9 and 17 milliseconds. However, some operators are hooking up two MS connectors in series to increase these intervals. This points up one of the principal advantages of MS electric caps; namely, they provide a wide range of delay intervals. As opposed to this, however, Primacord MS connectors can give a total delay sequence of unlimited length, far beyond that available with MS delay caps.



● Two general types of progressive firing layouts. (Top): Sinking method for concentrating muck pile in small area. (Bottom): Side-hill or through-cut method for windrowing muck pile along centerline. (Sketches from Atlas Powder Co.)

Variation of alternate firing sequence and buffer blasting adapted by Ohio Turnpike contractor to blast sandstone rock ledge.

Firing Sequences

Basically, there are two distinct types of firing sequences in common use: the progressive and the alternate systems. Still relatively new and not as yet commonly applied is another system called the progressive-alternate, essentially a cross between the two basic types.

Contractors almost overwhelmingly favor the progressive system in blasting cuts, whether sidehill or through, for greater control of throw and for centering the muck pile. In this system of firing, the shortest delay periods are placed along the line where the muck pile is to be centered, usually the center-line or sometimes a slopeline. Delay periods then increase progressively outward from that line, row by row. For example, in a through cut, the sequence of periods by rows may be 0-1-2-3, etc. outward from the center-line row, on one side or on both sides.

Another example of progressive firing is termed the "sinking" method which centers the muck pile in a selected small area rather than on a line. The borehole pattern in this case may be ringlike with delay periods increasing outward in each direction from the centering area.

More frequently applied in quarries or open-face blasting, the alternate system with bottom hole detonation has non-consecutive delay periods from hole to hole or row to row in somewhat of a regular pattern; for example, 3-1-3-1, etc. This type of firing is reputed to be effective in hard, massive, slow-breaking rock formations. It has a tendency to restrict throw in some cases more than the progressive system, but normally does not produce greater vibration. One contractor on the Ohio Turnpike successfully applied a variation of this method and buffer blasting to a soft sandstone ledge. A muck pile from a previous shot was at the same surface elevation and lay against one side of the ledge as a buffer. The first row of holes nearest the muck pile had No. 1 delays, while the second row had alternate No. 2 and No. 3 delays. The third row had No. 5 delays throughout, as sketched.

Some general examples of both types of systems are illustrated, but needless to say there are enumerable variations possible for both systems as already evidenced by actual shots.

Contractors have been quick to take advantage of short-interval delay shooting and of new drilling equipment to vary their drilling patterns for optimum results.

To a great degree, the quality and structure of the rock formation are the principal factors which determine the borehole size and pattern to obtain the required blast effects, whether concern is over breakage, throw, minimum vibration, maximum yield, or any combination of them.

Other objectives, of course, have influenced the drilling pattern including control of slope shattering, muck pile displacement, ribs, backbreaks, overbreaks, and toe conditions. There is much information in handbooks to assist in selecting a pattern for trial shots. Adjustments can then be worked out by trial and error until the most effective drilling pattern is found.

Some basic considerations and factors affecting drilling patterns may be summarized. Close spacing and small burdens give better fragmentation. Yield, however, is increased with widely spaced boreholes. Small variations in spacing may increase or decrease blast effects by approximately 20 per cent. The harder the rock the tighter and more concentrated is the borehole pattern. Sub-drilling will vary directly with working bench height, type of rock, method of charge initiation, and toe conditions desired. Smaller diameter holes and lower strength explosives will entail closer spacings. For a definite delay interval known to be optimum for a given shot, the drilling pattern may require some altering for this reason alone.

Because of the limitless variations in drilling patterns, the following will only outline the trends in blasting hard and soft rocks, and some special

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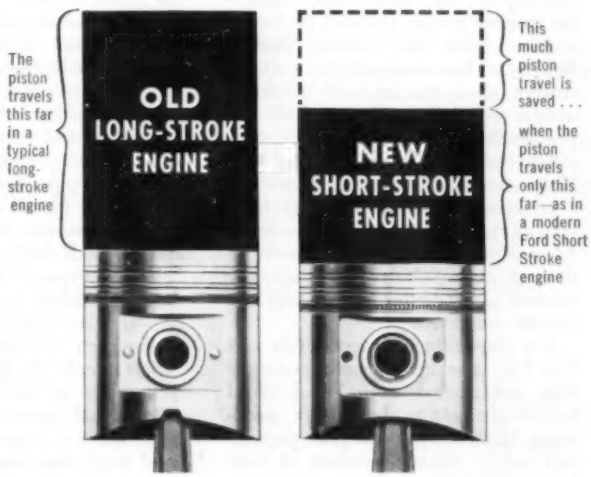

Diagram shows difference in piston travel between typical long-stroke engine and *modern* Ford Short Stroke design. Ford pioneered in Short Stroke design. And only Ford gives you a Short Stroke engine in every truck. That's one reason why Ford was first in sales gains in 1954—the *only* leading make to increase sales!

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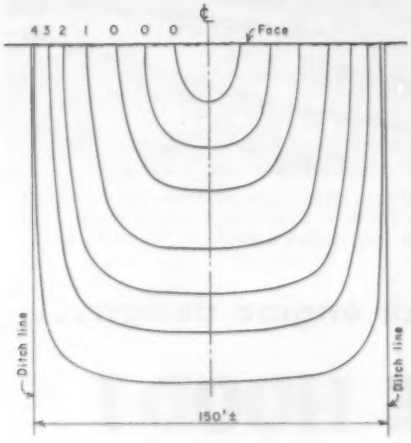


Shown in picture and diagram
(Case No. 10 — no text reference)

Complex firing pattern required in wide shallow cut through granite on Maine Turnpike. Single working lift was 17 ft. deep; holes were 4 ft. centers and set in U-type row layout, as sketched on right. Firing pattern from centerline out featured: first four rows at zero delay, next two or more rows at No. 1, then two or more rows at No. 3, and six or more at No. 4. Average of 700 holes fired in one shot with MS electric caps. At top, vertical holes being drilled; while those completed have been plugged to keep out water.

techniques that have been devised for treating certain shooting problems.

Hard Rock. For blasting granite, basalt and limestone, drilling patterns feature close spacing and small diameter boreholes. Wagon drills are practically standard equipment with either carbide insert or multi-use bits. Holes are usually spaced from 3 to 7 ft. apart. Working lifts vary from 6 to 24 ft., although 18 ft. is considered maximum for optimum results in through cuts. Sub-drilling is strongly favored to get better bottom pull and cleaner cut floors.

For conventional wagon drills and 3 to 7 ft. spacings, diameter generally does not exceed 3 in., and steel lengths are held to about 18 ft., maximum. Multi-use bits are quite popular and widely favored, because of their low cost and the ease with which they can be reconditioned. Carbide insert bits, on the other hand, are generally selected only for the hardest and most abrasive types of rock, and have proved to be worth their higher cost.

Drilling rates have varied considerably on different jobs and for different types of hard rock. One western contractor averaged 48 ft. per hour in hard basalt on vertical holes with 2⅛-in. carbide insert bits. For limestone, the rate averages between 40 to 60 ft. per hour. Several contractors have improved their drilling production by using long lengths of 4-in. aluminum pipe for air lines; while others have placed more units of portable compressors in close to the shot area for both drilling and blowing out holes. All types of drilling are in evidence including toe, diagonal, vertical, and horizontal to fit the particular rock and shooting conditions.

Soft Rock. In cuts through soft rock, such as shale, conglomerate, caliche and certain types of sandstone, there is a pronounced trend toward large diameter boreholes drilled with rotary drills. Bit diameters range from 3 to 5⅝ in. and depths from 6 to 60 ft. Bits are generally cone type. Holes are spaced wide apart, usually 10 to 18 ft. The majority of the rotary drills are truck mounted and are highly mobile. In shallow rock overburden of soft shale, one contractor successfully drilled with a 6-in. power auger on a West Virginia Turnpike contract. Some have gone to even greater diameter boreholes by using churn type drills up to 9 in. where a soft, deep strata of rock existed.

Special Techniques

(1) Diagonal toe drilling in conjunction with large, rotary-drilled vertical holes at wide spacings to insure bottom pull in varying rock strata.

(2) Alternate wagon and rotary drilled holes in cracked, fissured rock with earth seams.

(3) Working and drilling for longer faces to obtain maximum production and efficiency from shovels and hauling wagons.

(4) Wide cuts worked from center-line to one slope line in as long a face as possible.

(5) Deep cuts worked in deep lifts with larger diameter boreholes and greater spacing, if rock characteristics permit. Blasting of this type is usually done for an open face across, rather than parallel, to the center-line.

(6) Use of large electric shovels from 5 to 7 cu. yd. bucket capacities and big wagons to enable larger fragments to be handled, thereby enabling greater borehole spacing for increased yield.

(7) Slopes and pay lines controlled by careful staking, varying depths of slope holes, drilling holes inside and parallel to slope line, carrying vertical holes up slope, and firing slope holes at latest intervals.

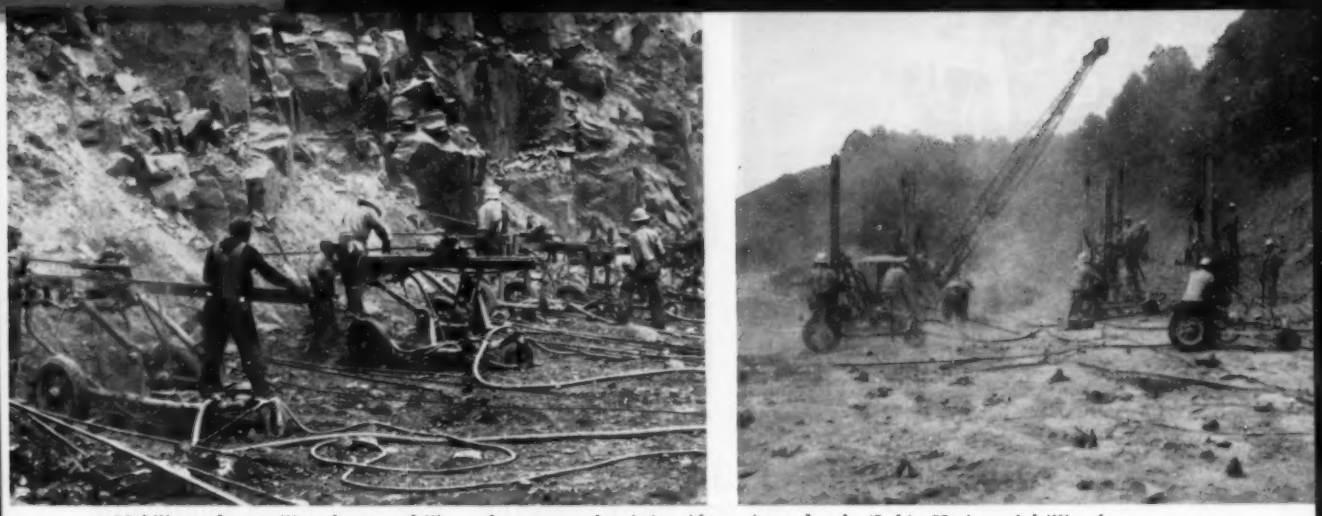
(8) Ribs minimized between successive shots by placing millisecond caps of longer delay periods in end holes of each row. For example, the end holes of a No. 3 delay row would have No. 4 delay period caps.

Size of Shot

The size of shot or number of holes fired in one blast varies considerably and is largely dependent on whether it is in open or built-up areas, as well as on drilling and other shooting conditions.

In open areas the practice is to fire as large a shot as possible, enough at least to keep shovels in operation between successive shots. By using MS caps and new condenser discharge type blasting machines, several contractors have shot as many as 1200 caps in parallel series with 30 series of 40 each. Others have been forced to limit their maximum number of shots to much less.

In built-up areas, possible structural damage from vibration and excessive throw, plus noise and concussion, greatly limited the size of an instan-



● Mobility and versatility of wagon drills are key reasons for their wide use in roadwork. (Left): Horizontal drilling for through-cut in traprock. (Right): Vertical drilling in sandstone.

taneous blast, and thereby made rock excavation costs almost prohibitive. With the advent of short-interval delay method the blasting situation in such areas has improved considerably. Because of less vibration and greater control of throw, more holes and larger amounts of explosives can be fired in a single blast than heretofore by other methods.

It has been established that there is a definite minimum number of holes which can be fired in millisecond delay sequence to obtain least vibration; some authorities consider this to be 8 large diameter holes. There also, on the other hand, appears to be a maximum limit for the number of holes which can be fired for set delay intervals without exceeding vibration limits. But this maximum figure will vary greatly for different rock formations and from job to job.

Many examples can be cited to illustrate the effectiveness of short-interval built-up areas. One, for example, involved a rock cut of 35,000 cu. yd. for an Oregon highway. The rock was tough, spongy, and blocky basalt. One portion of the blast area was within 50 ft. of a line of houses. Instantaneous shooting was attempted, but resulted in bad throw and breakage, using a loading factor from 0.62 to 0.75 lb. per cu. yd. Substitution of millisecond delay electric caps, No. 1 through No. 5, enabled the firing of a minimum of 100 holes on a 7 x 7 ft. spacing. Boreholes were 2½ in.; bench height was 24 ft. The loading factor was safely increased to approximately 1.25 lb. per cu. yd. There was very little vibration, practically no throw, and excellent breakage.

Loading Data

Types. No special type of explosives is necessary for short-interval delay blasting. Explosives' selection is governed principally by the quality of rock, relative costs, moisture conditions and other factors. For hard rocks, excellent results have been obtained with 40% gelatin, semi-gelatin, and 60% ammonia gelatin; whereas, for soft rocks, 40% ammonia dynamites are in wide use.

Explosives Factor. Basically, higher loading factors result from hard rock blasting, use of low strength explosives, through cut shooting, and obtaining maximum breakage or throw. On the other hand, low loading factors result from soft rock blasting, use of high-strength explosives, open face shooting, and obtaining limited breakage and throw. Borehole depth, size, and spacing have a greater effect on loading factor when the shot is tight or closed, as contrasted with open face shooting.

Through cuts in typical hard rock formations average from 0.5 to 1.2 lb. of explosives per cu. yd. using closely spaced, wagon drilled holes up to 2½ in. with working lifts up to 24 ft. For rotary drilled boreholes at wide spacing, with diameters from 3 to 5½ in., and depths to 50 ft., the loading factor may reach as high as 1.5 lb. per cu. yd. Good breakage has resulted using bottom hole detonation in shallow and small boreholes at close spacing in massive, tough basalt with a loading factor of only 0.62.

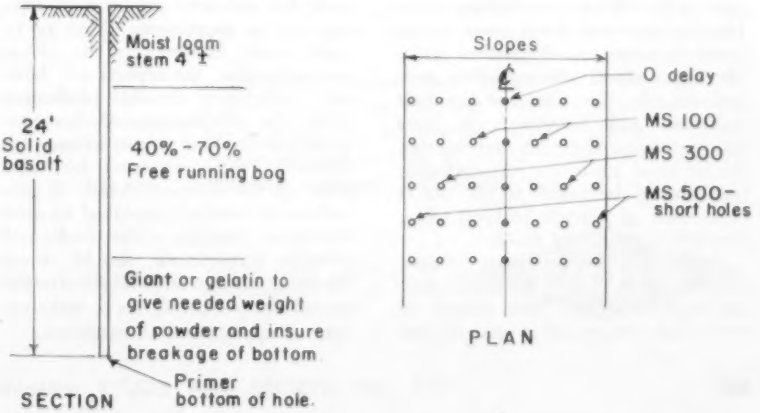
Deck, solid column, and concentrated bottom loadings are equally applicable to short-interval delay blasting, as is the placing of different strength and density explosives in the same borehole.

No clear-cut correlation could be established between instantaneous and short-interval delay blasting regarding loading factors. Many contractors chose the short-interval delay method without experimenting with the instantaneous. Other reported that records and statistics were not kept. Obviously, the foremost saving in explosives effected by short-interval delay shooting is from the reduction in secondary blasting reported on most jobs.

Misfires and Safety Precautions

Quite noteworthy is the fact that surprisingly few contractors are experincing misfires or cut-offs in short-interval delay blasting. This may be attributed to several reasons. One is that because it is a new method, the blasting crew is apt to give closer attention to all safety details, probably

● Sketch of firing and loading pattern used by Oregon contractor to blast massive diced basalt, as described in Case 2.



● Truck-mounted rotary drill found wide use in soft rock cuts on West Virginia Turnpike.

● A bank of three compressors, manifolded to discharge through one aluminum pipe air line.

more so than in using older methods with which they are thoroughly experienced and hence apt to be more careless. Another reason may be the over-all stricter enforcement of safety regulations in construction blasting. As jobs are getting larger and more complicated, what may have been a minor accident several years ago in terms of damage to equipment and slow-down in production may now be of major proportions in cost and injury. Then, again, another factor could very well be the close observance of the manufacturer's recommendations for short-interval delay applications. In any event, misfires and cut-offs are not any greater in delay firing than by instantaneous, and possibly less.

For electrical firing with short-interval delay caps, most of the general precautions are in evidence, such as insulation against grounds, shunts, circuit testing, and final hook-ups only in clear weather and just before shooting. Because of the danger through premature explosion by extraneous electricity, firing with Primacord is sometimes substituted near power lines or other electrical utilities with caps far removed. Vehicle-mounted radios are turned off or disconnected in the limits of the shot area as an added safety measure; recent tests, however, show that damage from such transmissions is quite remote.

Special Aids and Assistance

Public damage suits and complaints are always likely possibilities when blasting near populated areas or adjacent to structures. Regardless of the blasting method seismographic tests and records of a shot are the best insurance and safeguards in legal suits involving damages and injuries. To be most effective, seismographic tests should be taken at the outset or as early as possible to keep vibration below complaint levels.

Some contractors carry seismographs as part of their standard blasting equipment and take records of every shot. Others call in seismologists when needed; whereas there are those who have never had any occasion for their use.

Many types of seismographs are available, some which only trained experts can operate. One portable instrument on the market, however, requires no high degree of training or skill. It measures and permanently records transverse, longitudinal, and vertical ground movements and can fit the seismographic needs of most operators.

Additionally, seismographs have proved their value not only in damage cases but also for studying the effectiveness of one's particular blasting procedure. Types of explosives, drilling patterns, methods of loading, firing sequences, delay intervals, and size of shots all can be relatively evaluated and correlated to the amount of vibration, rather directly and without too much difficulty by experienced blasters. Independent sources, such as seismologists or consulting firms can be employed to determine vibration relationships to blasting conditions.

The U.S. Bureau of Mines has made extensive and authoritative studies on the amplitude and frequency of vibration and their effects on different types of buildings. Such data are publicly available in the Bureau's technical publications.

Photographic recordings of a blast with new high speed cameras have also received considerable attention. Such equipment pictorially records the actual sequence and development of explosive stress through a rock burden; the first cracking and shearing planes; release of gases at the top; and pattern and direction of flying fragments.

An excellent source of technical assistance is that provided by explosives manufacturers through field representatives and engineers. There are many instances when contractors have profited by requesting such representatives on their job to solve various blasting problems. Assistance of this nature is usually obtained by executing technical service agreements for the legal protection of all parties involved.

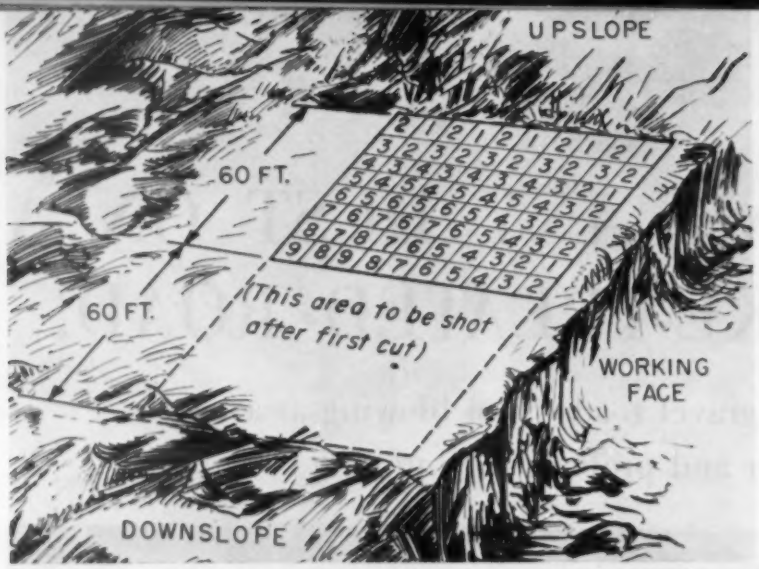
Case Samples of Blasting Methods

Taken From Contractors' Job Reports

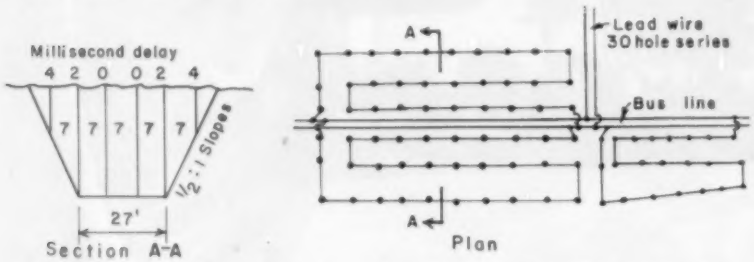
From field notes and contractors' records, case histories of specific short-interval delay shots have been compiled and some are herewith summarized to supplement those previously cited. Although by no means comprehensive, the reports are, however, sufficiently detailed to demonstrate the adaptability of this new technique in road construction. Additionally, these various jobs also point up the different details in procedure and method employed by each contractor. Analysis of the results and benefits, furthermore, should reveal the many distinct advantages of millisecond delay blasting for a wide variety of applications in roadwork.

1 — Difficult Granite Shot

Excavation for a Massachusetts highway interchange entailed blasting 130,000 cu. yd. of medium-hard granite under difficult restrictions. The rock cut was within 1,000 ft. of a residential area and extended under two 110,000 volt power lines. Fortunately, the rock ledge was sufficiently seamed and jointed to permit good breakage with an average loading factor of 0.8 lb. per cu. yd. To keep vibration low, the contractor fired only 200 to 400 holes in each shot working a 24 ft. lift. Boreholes were 2¼ in. on 5½ to 6 ft. spacing and burden. Millisecond electric caps of 0 (zero) to No. 8 delay periods were



● Sketch of typical firing layout used by New York Thruway contractor in blasting through built-up area, as explained in Case 7.



● A through-cut in badly cracked and seamed conglomerate and caliche was blasted by this firing and drilling pattern on an Arizona project. (See Case 5 for details.)

fired in progressive sequence to windrow the muck pile along the centerline, as shown in Case 1 sketch. This sequence with bottom hole detonation gave good results, and therefore, no other methods were tried. Vibration was insufficient to cause structural damage, as revealed by six different seismographic recordings. Throw control was very good, but backbreak was only partially reduced. Over-all shovel production was increased because of suitable primary breakage and less wear on buckets. There was no difficulty with cut-offs or misfires. The contractor's solution for shooting underneath the power lines was to use Primacord and surface initiation with caps and lead wires well outside the line limits.

2 — High Production

This job is an example of blasting in an open area with the principal objectives being to obtain good breakage and high production. The rock formation was hard abrasive basalt and the cut involved about 200,000 cu. yd. for an Oregon highway. Up to 1200 holes were fired in a single shot, with boreholes at a 7 x 7 ft. spacing and working lift kept at 24 ft. on the average. Drilling equipment consisted of wagon drills and 2½-in. carbide insert bits; the blasting machine was a Du Pont CD 45. According to the contractor his best success with basalt has been by pulling the bottom through bottom hole detonation with millisecond electric caps, and so this was done. The firing layout featured a delay sequence of 0-100-300-500 from centerline to slope lines (Case 2, as sketched). A loading factor of 0.62 lb. per cu. yd. gave good throw and backbreak control. A notable feature was the loading. A dense type of Gelatin was put in the bottom, topped with 40 to 70 percent strength, free-running explosive, and about 4 ft. of moist loam stemming. Vibration was marked, but this was unimportant. Although no statistics were compiled, the contractor stated that any added cost by the millisecond method was offset by the results. No misfires reported.

● Cleaning up a 350,000 cu. yd. through-cut on New York Thruway, illustrating heavy blasting required in current roadbuilding.

3 — Small Hazardous Shot

One contractor briefly reported as follows:

"We are building a road through a hard and very tight dice rock formation. The new alignment passes through an industrial plant area. Elevated water tanks, power lines, etc. are within 25 to 50 ft. of the new road. Used wagon drills and large bits to keep the powder in the bottom to minimize throw. Millisecond delay electric caps worked very well: did not disrupt power, no vibration damage, no damage from throw and no secondary blasting. Total maximum cut was 2,000 cu. yd., with average working lift of 6 ft. Bit diameter was 3 in. Borehole spacing was on 6 ft. centers, and burden was from 8 to 9 ft. Average number of holes fired in one shot was 150. Progressive firing was selected to control movement of material. Millisecond electric caps were used exclusively and placed in the bottom of boreholes for better lifting effect and less danger of shooting out. Big problem was no vibration or no throw. It is doubtful if any other method could have produced comparable results; in fact, the shot would have been very difficult without millisecond firing."

4 — Low Vibration, Good Breakage

For a highway bypass in Pennsyl-

I Case 8 (see page 86). Drilling row of holes for depressed section of Cross-Bronx Expressway, New York City.

II Mats have been placed, and everything is ready for shooting.

Buildings Were Right on Top of This Contractor

III Three or four holes at a time — millisecond delay caps — "savvy" on use of blankets. Result: safe blast with least vibration. (ROADS AND STREETS photos.)

vania, the contractor had to blast through a limestone formation under both open and tight shooting conditions. The shot area was near enough to houses that vibration had to be minimized, but good fragmentation also was required. Variable drilling patterns were used, but millisecond electric caps were used throughout. Best delay interval was found to be 100 milliseconds. Most holes were spaced 6 x 6 and working lift was 12 ft. Wagon drills and 3½-in. bits were used exclusively. Detonation was at the top of the boreholes and firing sequence was progressive. Loading factor of 0.5 gave good breakage, minimum vibration, and control of throw. Backbreak was normal. This contractor employed seismographic experts to provide information as a safeguard against complaints from blasting damage. For safety purposes, all vehicle mounted radios were inactivated.

5 — Soft Seamy Rock

Blasting through a formation of conglomerate and caliche with prominent cracks and layers forced a contractor on an Arizona project to constantly vary his drilling pattern and borehole size. Drilling equipment included 9-in. churn drill and wagon drills with 2⅝-in. carbide inserts, 4-in. drifters. Spacing averaged 7 ft.; burden 18 ft.; and working lift, 20 ft.

Although few details were reported on the firing layout, the contractor stated that the muck pile was windrowed along the centerline by setting 0 (zero) delays in two rows of boreholes, each 3½ ft. from the centerline (see Case 5 sketch). Millisecond electric caps, bottom hole detonation, and progressive firing sequence were employed entirely. Loading factor averaged 1.0 lb. per cu. yd. for a total quantity of 180,000 cu. yd. In some of the shots, backbreak was bad, but other blast effects were satisfactory to justify the use of MS caps. About 300 holes were fired in each shot for best results.

6 — Large Diameter Boreholes

On a West Virginia Turnpike contract, deep working lifts up to 60 ft. were reported successful by a contractor. Drilling equipment consisted of a 5¾-in. rotary drill with 5⅞-in. bits. Spacing was cut down from 10 x 14 ft. to 10 x 8 ft. to reduce overage. Rock formation was sandstone and shale strata with some coal seams. The firing system consisted of millisecond caps and Primacord for surprimed with primacord and the MS caps were placed on the surface at each end of the shot between borehole rows; only two caps for each delay interval were required. Delay periods were 0, 8, 28, and 50 milliseconds, outward respectively from the centerline. Good fragmentation was obtained with estimated 1.5 loading factor. The contractor reported that for the last shot, 106 holes were figured by this system.

● Sequence shows priming, loading, and stemming a 5-in. dia. borehole. (Left): Priming a cartridge with electric cap. (Center): Placing bagged, clean sand for stemming between cartridges. (Right): Lowering an intermediate cartridge by rope tied in slip knot.

Deck Loading is Speedy for Large Boreholes

7 — Blasting in Built-Up Area

Close control of throw and flying fragments was mandatory on a New York Thruway section passing through a built-up area, (see sketch and photographs for Case 7). About 13,000 tons of granite and traprock were blasted with houses 25 ft. from the shot area. The rock ledge was from 50 to 75 ft. above the houses. An average 100 holes spaced on 6 ft. centers and ½ ton of explosives were shot at one time. Working lift was 24 ft. deep and 60 ft. wide, or half the width of the roadway section. Holes were stemmed with 12 ft. of sand. No damage was reported from vibration or flying rock.

8 — Metropolitan Area

An example of blasting in extremely close quarters, in the midst of buildings and structures, is illustrated in Case No. 8. A contractor familiar with the New York City area performed the blasting, as part of an extensive grading and structure contract for a segment of the Cross-Bronx Expressway.

At the location pictured, the expressway depresses and will pass via twin cut-and-cover tunnels beneath a traffic circle area, which is flanked by retail stores, some located within 50 ft. of the blasting. Further complicating the project is the fact that an elevated (subway) railway passes over at the same junction, and blasting had to proceed in the midst of underpinning and remodeling work on the subway station — within 20 ft. of blasting at times.

The solid mica-schist formation was drilled with Gardner-Denver wagon drills and numerous jackhammers, using 2½ in. Timken carbide insert bits. Two types of shooting were being done when the photos were taken. One was to drill a line of holes, not over three or four at a time, along the base of an existing underground concrete conduit wall, lay heavy steel cable blankets, and shoot to carry excavation down back of the wall. The other situation consisted of working the remaining ledge forward through the cut, past the corner of the station building, shooting a single row of holes at a time under blankets.

In both instances the foreman used millisecond delay caps, the holes being fired 0-1-2 or 0-1-2-3, taking three or four holes at a time. Each hole was loaded with 20 sticks (10 lb.) of Atlas 40% special gelatine. Detonation was by a Du Pont battery machine.

Conforming with requirements of the City of New York, a record was made and filed for legal purposes giving the exact time (to the second) for each blast, and its exact location. The blasting for this job was aided by the existence of solid rock under the area. Despite the hardness of the schist, it was handled readily by a foreman and crew experienced in the material.

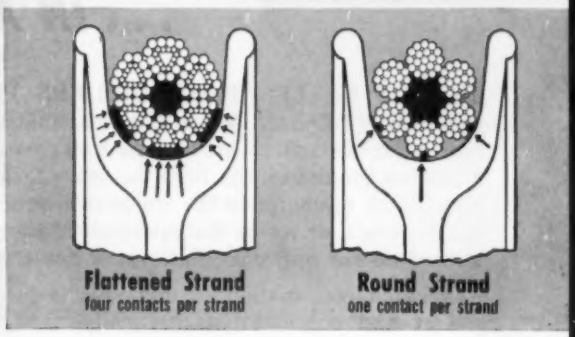
● New split-second stereo camera for studying blasting.

Special Camera To Record Blasts

Fast cameras and modern photographic techniques are providing explosive engineers with concrete evidence of elusive blast phenomena. Photographs, taken with both special and standard cameras, have contributed greatly to the development of the more efficient blasting which is being accomplished today in mines, quarries and on construction jobs throughout the country.

Atlas Powder Company in research on high-speed blast photography using the "machine-gun" type camera, has developed a new 3-D sequence camera specially designed to study the action of explosives on actual jobs. The camera shoots four synchronized stereo-pairs a second, enabling the viewer to see the separate phases of the blast in all three dimensions; thus helping him to trace more precisely, both in direction and distance, the movement of the burden.

The assembly consists of the camera unit, synchronizer, and power supply. Two special sequence cameras, connected by a triped mounted bridge section, comprise the camera unit. The cameras have shutter speeds of 1/200 sec. and are fitted with matched lenses set in calibrated focusing mounts. The cameras are adjustable to provide stereo viewing of subjects at distances from 100 ft. to infinity. A remote triggering cable allows the camera to be operated from distances up to 250 ft. The camera is powered by a separate 12-volt DC battery.



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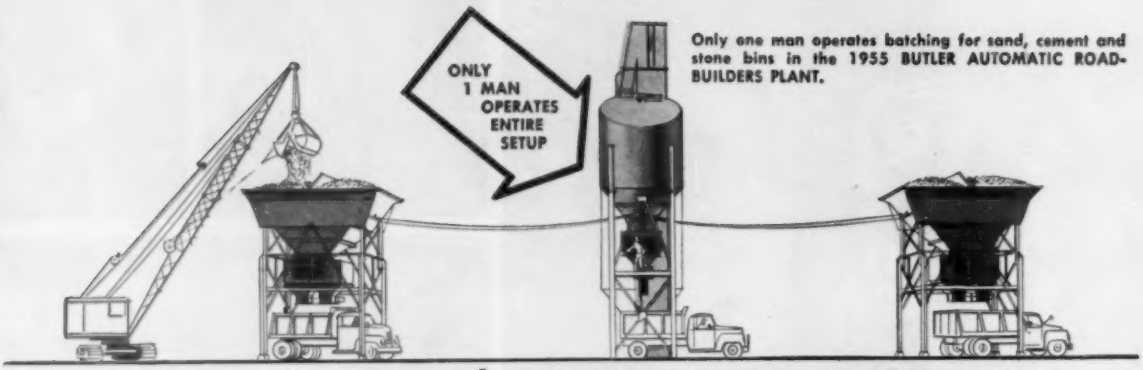

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NEVER BEFORE . . . { such high portability / such tremendous production / ONE MAN OPERATION

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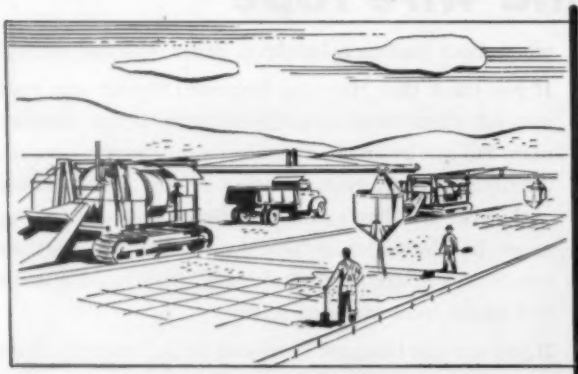

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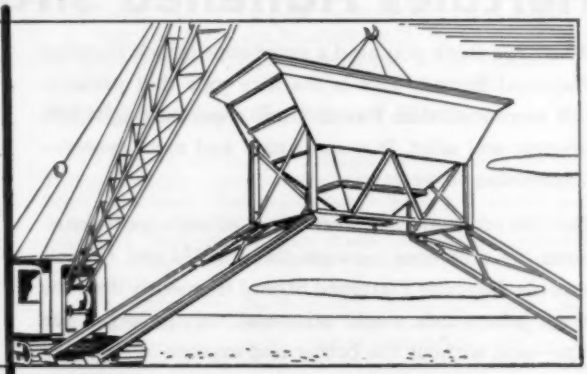

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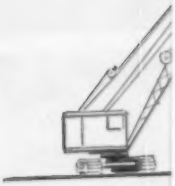

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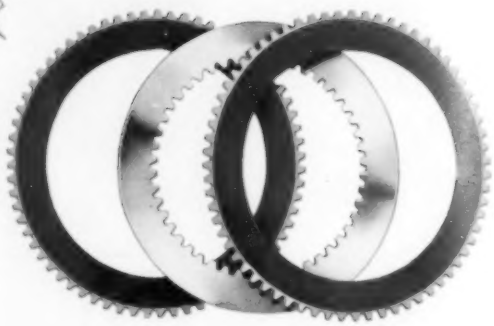

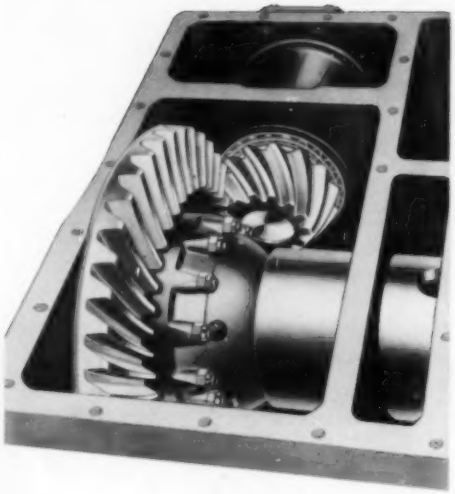

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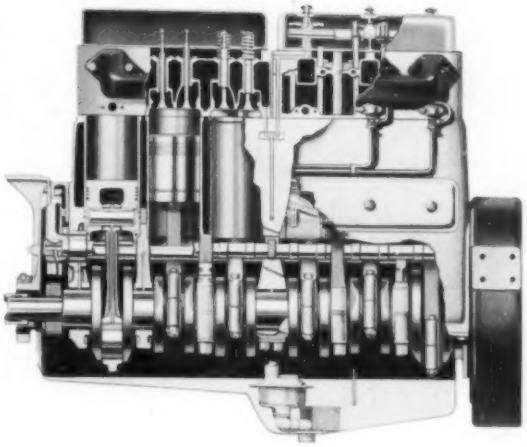

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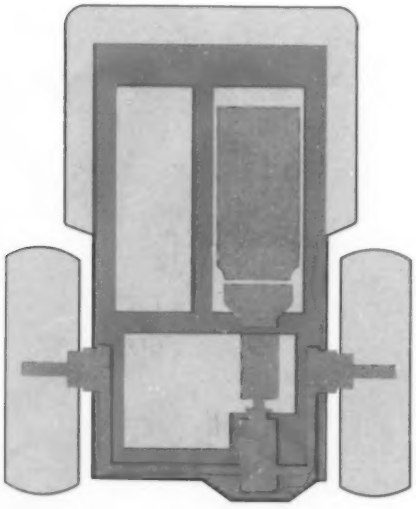

SPECIFICATIONS		
CAPACITY	Struck, cu yd—15 Heaped, cu yd—20	
SPEEDS mph at 2100 rpm	First	3.0
	Second	6.1
	Third	11.3
	Fourth	20.0
	Reverse	3.1
WEIGHT	49,000 lb	

New serviceability

With its new main frame, the TS-360 offers the simplicity of unit construction... easy removal and servicing of both major and minor assemblies.

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Assure ample braking pressure at all times.

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NEW BIG-YARDAGE WORK CAPACITY

Power that pays The TS-360's great new Allis-Chalmers engine spearheads a whole new power train that offers more rim pull at all speeds for better loading, hauling and spreading performance . . . faster acceleration, easy shifting and quick getaways. Combined with new 20-yd capacity, this all adds up to fast, high-volume, high-profit work cycles.

New operating ease and safety In addition to big-job power and gearing, the TS-360 Motor Scraper offers everything an operator needs to work easily, yet efficiently . . . new Double-Safety air brakes, new selective steering, direct electric starting, new multiple-disc cable control . . . and many others you'll want to know more about.

Strength to back it up! The new TS-360 is built around a new, all-welded, heavy steel main frame that makes possible the service accessibility of unit construction. What's more, there's an all-new final drive gear train, with new gears, shafts and bearings. These and many other advantages mean more work done, lower maintenance cost and longer equipment life.

ALLIS-CHALMERS

TS-360

SPECIFICATIONS

The inside facts

BIGGEST MOST POWERFUL CRAWLER IN PRODUCTION...ANYWHERE!

New standards of output The HD-21 introduces the new Allis-Chalmers engine and a great new power transmission team. Together, they provide extra speed with any load, extra pulling power at any speed . . . wider speed ranges and more range overlap. And with its advanced design torque converter (*the result of 15 years of experience by Allis-Chalmers*) the HD-21 puts its power to work with less shifting than ever before possible . . . to help you reach a new high in efficient, profitable production!

New standards of durability From the new Allis-Chalmers diesel with "follow-through" combustion to new, heavier Tru-Dimension track, the HD-21 is built to take today's big loads in stride, and come back for more. Here are just a few more of the long-life features you can't get from anyone but Allis-Chalmers . . . at any price: all-steel Box-A main frame, straddle-mounted final drive gears, 1,000-hour truck wheel lubrication, oil-enclosed track release mechanism.

New low cost per unit of work The HD-21's outstanding performance and durability provide a new measure of tractor value. Add the *planned* approach to service offered by Allis-Chalmers dealers, and it's the ideal team for men tackling today's *big* jobs.

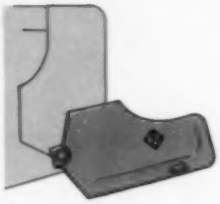
SPECIFICATIONS

ALLIS-CHALMERS

HD-21

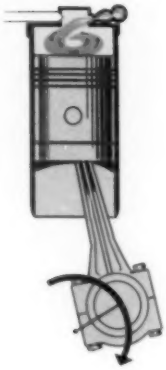
The inside facts

New Allis-(



New "wrap-around" radiator guards

The cost of mounting bulldozers is reduced because hydraulic rams or cable-lift sheaves mount directly on new "wrap-around" guard. For easy service accessibility, guard tilts forward.



NEW...FROM TRACK

Built to outlast all others!

SPECIFICATIONS

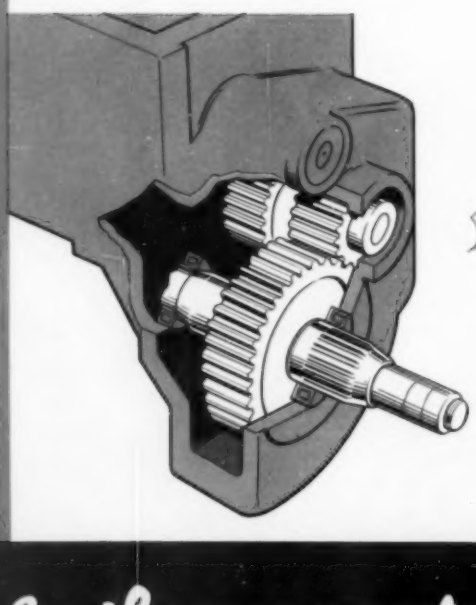
WEIGHT 44,000 lb
204 flywheel hp

SPEEDS

Gear Range	Speed mph
Low	0–3.0
High	0–7.5
Reverse	0–5.5

New True-Dimension track

New in design, heavier and stronger . . . plus new advances in wearability. New heat-treating methods permit achieving optimum hardness throughout the track sidebar for maximum wearability and toughness . . . longer life, more time on the job.



New, heavy straddle-mounted final drives

Provide ample strength for today's bigger mounted equipment, bigger loads. And the HD-21's entire final drive assembly rides in a rigid, one-piece steel case, with *all* gears straddle-mounted on tapered roller bearings to insure better performance, longer life.

A host of new features

Heavyweight front idlers and truck wheel high-capacity cooling system . . . separate exchanger for torque converter . . . stress- main frame . . . heavy-duty 135-gal fuel t foam rubber seats and arm rests . . . man

. . . in the amount of work they do!

The new HD-21 and TS-360 are

BACKED BY ALLIS-CHALMERS DEALER SERVICE PLAN

Yes, your Allis-Chalmers dealer offers you original factory parts for both the HD-21 and TS-360 . . . plus a *planned* approach to service, right from the day equipment is delivered. It covers factory service schools, in-the-field lubrication schedules, operating tips and preventive maintenance.

You owe it to yourself to take full advantage of the Allis-Chalmers Dealer Service Plan to keep your equipment operating efficiently. Experience *proves* that it pays big dividends.

FIELD UNITS TO SPAN THE NATION

Specially-equipped trucks from the Allis-Chalmers Training Center, Springfield, Illinois, are on their way to the field *now*, as a special service backing up the introduction of the HD-21 and TS-360. First trips will bring factory specialists to locations all over the country to present the story on these great new dirt movers and their service advantages.

For all the facts on when one of the Field Units will be in your vicinity . . . plus full information on planned service, see your nearby Allis-Chalmers dealer.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

MS661-5503

Printed in U. S. A.

here . . . without a doubt . . . is the most useful buying catalog in your office

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- Gives you all the facts needed BEFORE you make a buying decision.
- Manufacturers' names and trade names indexed alphabetically for quick reference to individual catalogs.
- All the buying information is 'boiled down' — designed for your convenience.

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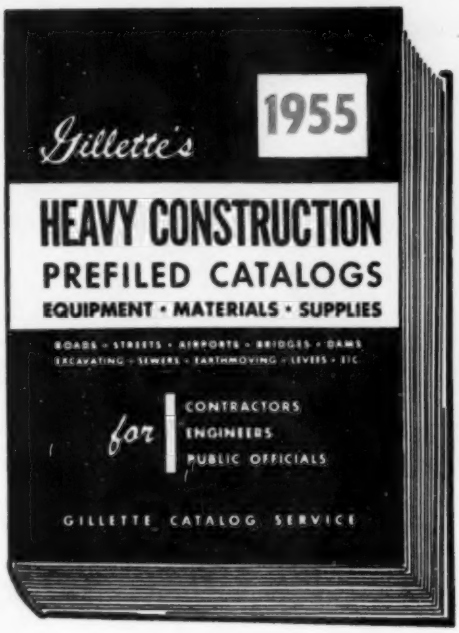


Here are the manufacturers represented in Gillette's Heavy Construction Prefiled Catalog:

Aeroil Products Company
American Steel & Wire Div.
Anthony Company
Armco Drainage & Metal Products, Inc.
Austin-Western Company
Badger Machine Company
Barber-Greene Company
Bicknell Manufacturing Co.
Blaw-Knox Company
Briscoe & Son, E. B.
Bros Boiler & Mfg. Co., Wm.
Buffalo-Springfield Roller Co.
Butler Bin Company
Carey Manufacturing Co., Philip
Chrysler Industrial & Marine Engine Corp.
Clark Equipment Company
Cleveland Trencher Company
Colorado Fuel & Iron Corp.
Concrete Surfacing Machine Co.
Continental Motors Corporation
Cummer & Son Co., F.D.
Cummins Engine Co., Inc.
Detroit Diesel Engine Div.
Dorsey Trailers
Electric Tamper & Equipment Co.
Erie Strayer Company
Flexible Road Joint Company
Flintkote Co.
Galion Iron Works & Mfg. Co.
Gar-Bro Manufacturing Co.
Gar Wood Industries, Inc.
General Motors Corp.
Gledhill Road Machinery Company
Goodall Rubber Company
H & L Tooth Company
Harnischfeger Corporation
Heil Company
Heltzel Steel Form & Iron Company
Henry Manufacturing Co., Inc.
Hogan Company
Hough Company, F. G.
Huber Manufacturing Co.
Ingersoll-Rand
Jackson Vibrators, Inc.
Joy Manufacturing Company
Keystone Asphalt Products Company
Kiesler Company, Jos. F.
La Crosse Trailer Corporation
Le Roi Company
Littleford Bros., Inc.
McKiernan-Terry Corporation
Mid-Western Industries, Inc.
Minneapolis-Moline Company
Naugatuck Chemical Div.
Owen Bucket Company
Pacific Car & Foundry Co.
Pioneer Engineering Works, Inc.
Reliance Steel Products, Inc.
Republic Steel Corporation
Rogers Brothers Corp.
St. Paul Hydraulic Hoist
Seaman Motors, Inc.
Servicised Products Corp.
Shawnee Mfg. Co., Inc.
Shunk Manufacturing Co.
Stow Manufacturing Co.
Symonds Clamp & Manufacturing Co.
Timken Roller Bearing Company
Toncan Culvert Association
United States Rubber Company
United States Steel Corp.
United Steel Fabricators, Inc.
Wellman Engineering Company
Wico Electric Company
Wisconsin Motor Corporation

● Footing bed of backfilled sand in place. End nearest camera given seal of lean dry, concrete. Partial failures shown prior to repairing.

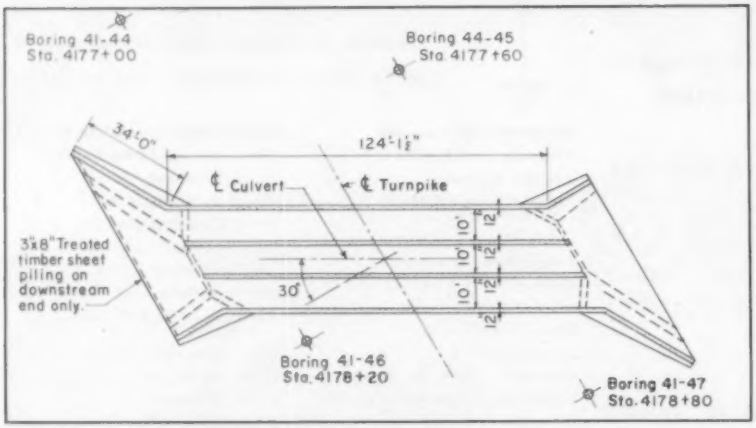
Big Triple Box Built in Dry at Swamp

PICTURED here is the beginning construction and a completion photo of a triple 14'x12 x137 concrete box culvert which answers a difficult drainage situation. The structure carries "No Name" stream, a small creek, under the Maine Turnpike at a point southeast of Lewiston.

A single-span steel I-beam bridge with a reinforced concrete deck slab was originally considered for the location. On examination of the site it became evident that the soil conditions were worse than anticipated. The engineers decided on a box culvert as being structurally safer and more economical under the boggy conditions.

Whereupon, early in the 1954 summer, the contractor began excavation for the box culvert, an act which marked the beginning of a summer-long tussle with the rainiest (and most hurricane ridden) season Maine has suffered in decades.

The first step was to re-channel the creek around the structure site — a relatively easy dragline job. Next the foundation area for the culvert was excavated and the mucky material piled around the sides and ends as a dam to permit construction in the dry. (This method was also used with success on two of the Turnpike's open small stream bridges during the 1954 summer.) The area was undercut 5 to 6 ft. or more and backfilled with gravel. Because of the saturated foundation condition a temporary surcharge consisting of about 5 ft. of gravel was placed to speed consolidation.



● Plan view of box structure and location of soil borings.

● (Left): Before undercutting foundation area. Note boil-up failures. (Right): After backfilling culvert area with sand. Note how area is damned in by muck piles.

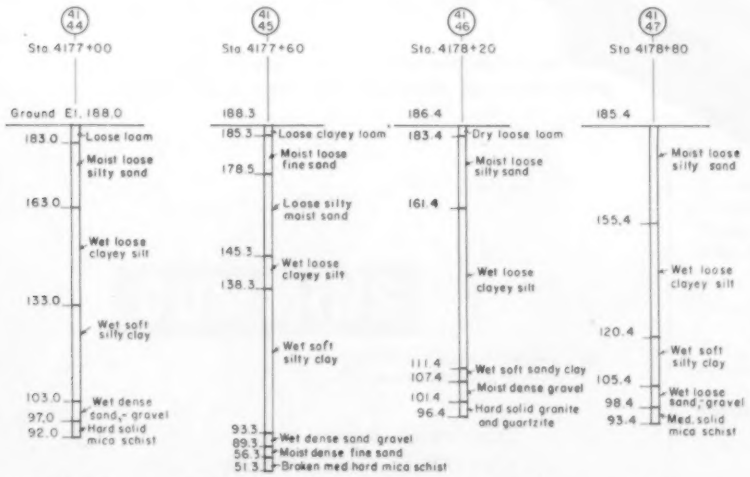
The weather continued to be exceptionally wet as work progressed, and excavation was set back twice by torrential floods brought by hurricanes. First attempts to remove the surcharge resulted in localized "boil ups." In accordance with plan details which anticipated such conditions, the contractor drove 6-ft. lengths of creosoted planking as a cut-off wall at the downstream end. Then, a design experiment was adopted consisting of a 4-in. thick seal of lean, dry concrete which was placed over an area extending from the planking to about 10 ft. back under the culvert box. A pair of 4-in. pumps then was able to keep the hole relatively dry, whereas previously a 3-in., a 4-in. and a 6-in. pump together couldn't pull the water down.

● The completed triple box, which was concreted during early winter months.

● Note crust of lean sand-cement mix before repairing. Also shown is the treated timber cut-off wall protruding slightly at base of header board.

All this trouble possibly might have been eliminated by well points, the contractors and engineers noted, except that the contractor was constantly expecting the abnormal weather to end and conditions to improve. As it was, on about November 1st, the reinforcing was laid and the 18-in. reinforced footing slab poured for the 1,000 cu. yd. concrete structure.

The contractor was Yonkers Contracting Co., Inc., of Yonkers, N.Y.



● Boring diagram, indicating great depth of unsuitable foundation material, requiring box-type structure in lieu of open bridge.

Howard, Needles, Tammen & Bergendoff are the engineers for the Maine Turnpike Authority; William B. Getchell, Jr., executive director.

Va. "specs" modernized on cold weather concreting

The Virginia Department of Highways has recently modified its highway specifications on cold weather concreting. This change will spell out the requirements for protecting concrete poured between November 1 and April 1, and the contractor will be required to submit and have approved his methods for such protection. Where the temperature is between 50° F. and 35° the water and, if necessary, the fine aggregate must be heated. Between 35° and 10° the water, fine aggregate and, if necessary, the coarse aggregate must be heated. No concrete operations will be conducted in temperatures lower than 10°. The air temperature around the forms will be maintained at 60° F. for 72 hours.

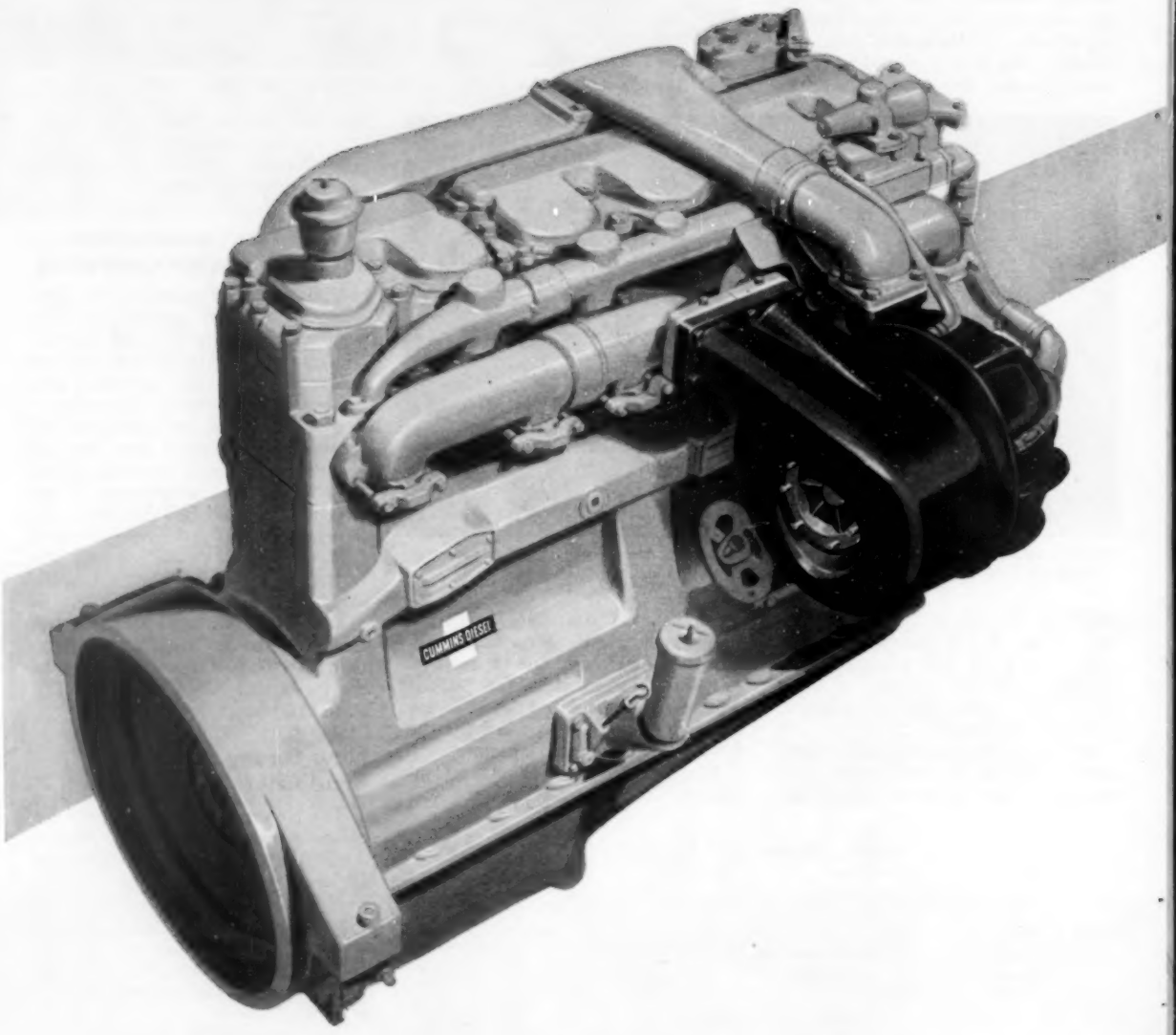
New Jersey seeks graduates

The New Jersey state highway department has announced the start of a recruiting program to add 20 young engineers to its ranks. The program is twofold in purpose, according to Commissioner Dwight R. G. Palmer: to fill present vacancies and to train qualified young men for responsible positions under the department's expanded program.

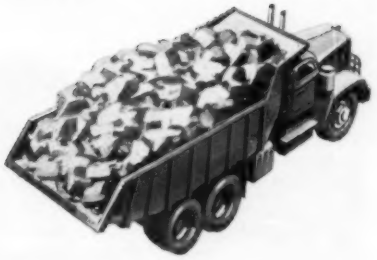
Representatives of the department will visit 20 or more colleges and universities within a two-month period in an effort to enlist the interest of the June graduate engineers.

Cooperating with the highway department's plan to obtain young graduate engineers, the N. J. Department of Civil Service will announce a competition for the position of Junior Engineer. The starting salary for successful applicants will be $4,020 a year, $540 above previous rate. Applications will be accepted through June 1.

NEW *TURBODIESEL*



BY CUMMINS



ups your production

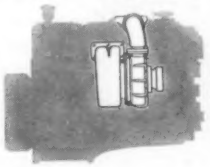
and lowers your costs!

Cummins new 250 h.p. turbocharged NT-6 can speed up haulage trucks, shovels, graders, tractors, and other construction equipment, because it produces greater horsepower without increase in engine size or displacement. Turbocharging—which harnesses exhaust gases normally wasted—produces this extra horsepower by achieving a more perfect air-fuel mixture in the combustion chamber.

In addition, Cummins exclusive PT fuel system is simple and trouble-free . . . makes fuel system maintenance costs negligible. It is so easy to work with that no specialists are needed. Fuel costs, of course, are kept at a minimum with No. 2 diesel fuel or furnace oil.

The NT-6 is also available with a torque converter that ups output even more by maintaining power without lugging, stalling, or overspeeding . . . and that reduces maintenance costs even more by eliminating shock loads on engine, machinery, and cables.

For the operator of Cummins 200 h.p. NH-600 models, a Turbodiesel Conversion Package will soon be available which will make it possible to add 50 h.p. to every unit. For further information, see the Cummins distributor in your area, or send us this coupon today.



Turbodiesel Conversion Package for NH-600 models includes turbocharger, new manifold, and gaskets.

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Cummins Engine Company, Inc.
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Name_____

Company_____

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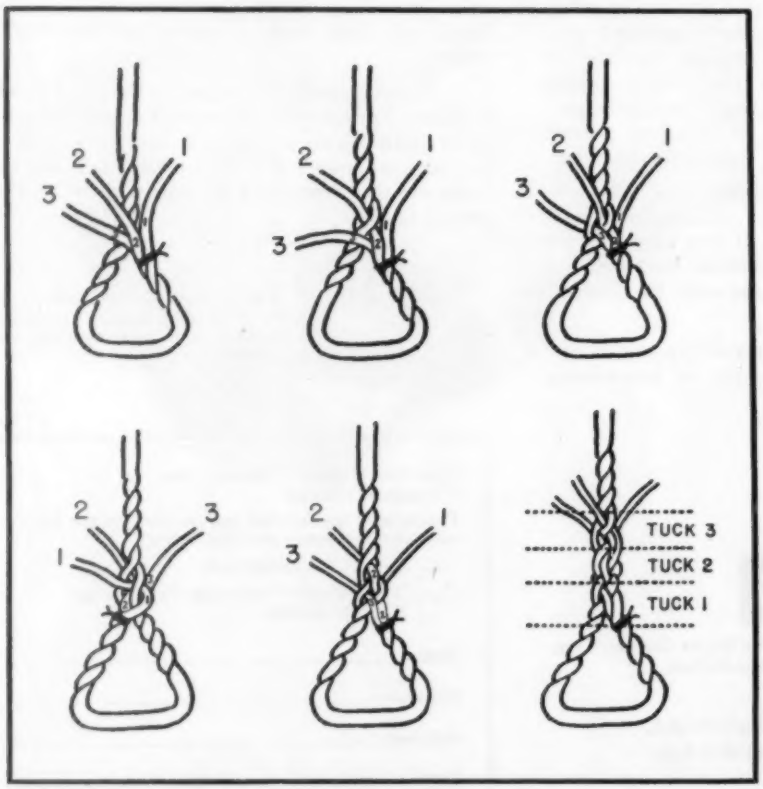
RS-5

. . . for more details circle 264, page 16

Job and Equipment Ideas

Concrete Widened Without Forms in N. Y. State

● A 13,500 ft. section of U. S. 15 near Wayland, New York was widened with 2-ft. concrete strips on either side, without the use of road forms. The job was a test operation, the first permitted by the New York State Department of Public Works, the firm of Holmes and Murphy of Orchard Park, New York, being contractors. About 2,200 ft. of widening per day was placed using a Blaw-Knox Model 95 road widener, placing concrete 8 in. thick. About 1,600 cu. yds. of concrete was used in the job requiring twelve days to complete.



● Diagramming some of the eye-making steps.

How to make eye splice in your heavy rope

A handy thing to know on construction work is how to splice rope. Good splicing not only provides a more permanent junction, but also a stronger connection than any knot.

A good splice is not hard to make, reminds the New Bedford cordage people. For example, to make an eye splice, as illustrated in the photograph, all that is required is to:

1. "Whip" or bind the end of each strand of rope with string or twine to prevent unraveling.

2. "Unlay" or unwind the rope about six "turns," or the length of six diameters. Some riggers whip rope at this point.

3. Twist the rope open at the point where the unlaid strands are to be tucked in.

4. At the untwisted point, drape one of the unlaid strands on either side of the rope and place one in the middle along the rope.

5. Insert a fid, or tapered wooden pin, under the top strand where the rope was untwisted. Hold open with thumb and forefinger and withdraw fid.

6. Pass the end of the unlaid center strand through the opened strand. Pull through and tighten.

7. Open the strand to the left and tuck in left-hand unlaid strand. Open the strand to the right and tuck in right-hand unlaid strand.

8. Repeat (6) and (7).

9. Repeat again. For a tapered splice, after finishing the second tuck, cut about half the yarns from the unlaid strands and make the third tuck with the halved strands. Cut the strands in half again and make a fourth tuck. Trim off ends.

As shown, an eye may be spliced about a thimble to provide protection from wear when the rope is in use.

● Illustrating step five in making eye splice.

AASHO Leaders Issue Policy Statement on Federal Legislation

As developed by the chief administrative officers of the member departments, meeting in Chicago, March 13, and released recently after departmental review

TO insure an expanding and sound national economy, the Federal-aid Highway Program should be continued and enlarged to more nearly meet the demands both current and future. The program should be administered and constructed by the Bureau of Public Roads and the State Highway Departments as in the past — a Federal-State relationship that has been highly efficient and outstandingly successful.

Should future Federal road legislation create a National Highway Corporation, Commission, or Authority, its duties should be fiscal only.

Considering the civil and the national defense, as well as the over-all economic well-being of the nation, the Interstate System of highways should be accorded priority treatment and its completion accomplished within 10 years. A substantial, balanced construction program, however, must not be sacrificed on the other Federal-aid highway systems.

The Interstate System should be built to meet the anticipated traffic demands of 20 years hence, and constructed to design standards promulgated and approved by the American Association of State Highway Officials, and with the application of, and the provision for, access control features in accordance with warrants promulgated and approved by the American Association of State Highway Officials. The location and design of the Interstate System should be the joint responsibility of the State Highway Departments and the Bureau of Public Roads. The actual determination of the location of the routes between control points should be based upon engineering studies, traffic analyses, and economic comparisons.

Restrict Interstate System

The building of the Interstate System would be jeopardized if it were redesignated or extended beyond its 40,000-mile statutory limitation.

The Interstate System program should be accelerated, and the Congress, in its good judgment, should determine the method of financing. If it is decided that it is necessary to finance the work by credit financing, the Association approves such action.

Because of the need for expediting the construction through all States simultaneously, provision should be made for the Federal Government, upon petition to the State and in the interest of national defense, to procure the necessary rights of way and access control on the Interstate System. Because of the heavy demands made upon the states for financing roads having more local interest than the Interstate System, and because of the national interest and responsibility of the Federal Government in the Interstate System, the Association recommends that the Federal contribution to the cost of the capital improvements on that system be between 90 and 95%, and that these funds be apportioned to States on basis of need.

The State Highway Departments should be responsible for the design, letting of contracts, supervising construction and, upon completion, should have the sole responsibility, at State expense, of maintaining, policing and operating the facility.

As a matter of equity and so as not to discriminate against the States that have already constructed a portion of the Interstate System, the Association recommends that a credit reimbursement should be allowed for any road that is properly located, designed, and constructed to be incorporated into and become a portion of the Interstate System, whether the road be free or toll, in accord with the following procedure:

(a) *Existing free roads.* Existing free highways measuring up to standards of the Interstate System should have the depreciated value determined from which would be deducted 10 per cent thereof and the total amount of any Federal-aid funds used in constructing the highway. The result then should be the credit to which the State is entitled.

(b) *Existing toll roads.* A State should be entitled to credit for an existing toll road, excluding the cost of financing thereof and of any facilities not of a highway character, that is properly located and constructed to meet the requirements of the Interstate System, and the amount of credit so allowed should be the depreciated value, not to exceed 40 per cent of the original cost where the road was completed prior to December 31, 1951, and not to exceed 70 per cent when completed between December 31, 1951, and December 31, 1955.

(c) *Future toll roads.* A State should be entitled to credit on a future toll road, when built to approved interstate standards, in the amount of 90 per cent of the original cost, less the cost of financing thereof and of any facilities not of a highway character, provided the project has progressed to the point that its financing has been arranged and completed by December 31, 1955. There should be no credit reimbursement for future toll roads after that date.

In the continuation of the Federal-aid Highway Programs on the Primary, Secondary, Forest Highway, and Urban Systems, authorization should be for a period of at least six years to allow the States to adequately plan and staff the programs. The current apportioning formulas and public lands sliding scale matching provisions should be continued with a 25 per cent transfer provision allowed between the Primary, Secondary, and Urban allocations to make the program flexible enough to meet the most pressing needs of the individual States.

Assuming an accelerated and enlarged Interstate Highway Program should be authorized by the Congress, the first authorization providing for funds on the Primary, Secondary, and Forest Highway Systems should be in at least the amounts provided in the Act of 1954. The Urban authorization could be decreased below the amounts provided in the Act of 1954 in proportion to the amount of Urban aid authorized under an enlarged Interstate Highway Program.

The subject of labor relations and requirements should not be included in Federal statute, but should be matter to be determined at State level.

Road Hearings to Emphasize Financing

THE House Public Works Committee announced that open hearings on road legislation, scheduled to begin on April 18, will place particular emphasis on ways and means whereby needed highway improvement can be realized. A memorandum sent by the Committee to prospective witnesses spells out eighteen specific areas in which testimony is sought.

Meanwhile, the American Association of State Highway Officials has made public a policy statement formulated by the association's Committee on Administration. (See page 103 of this issue.) It is understood however that some state highway departments are expected to present testimony to the House Public Works Committee which will differ, to some degree, with the association's over-all policy position.

The House Committee feels it is generally agreed that the national highway program should be accelerated, hence there is no need for testimony on the question of highway needs. It is a question of *how and to what extent, within Federal and State budgets.* It is suggested that all witnesses direct their testimony accordingly and the questions set forth below may be of assistance to witnesses in developing their statements:

1. To what extent should emphasis on the National System of Interstate Highways go in comparative relation to the regular Federal-Aid primary and secondary systems?

2. Should the Federal-Aid primary and secondary system programs be accelerated along with the special emphasis on the Interstate System? If so, to what extent and by what means?

3. Should a definite period, such as that proposed in H.R. 4260, be fixed for the completion of the National System of Interstate Highways, or should construction be accelerated or decelerated according to the availability of motor fuel tax revenues?

4. Should the existing ratio of matching for the Interstate System be changed from 60-40 to 90-10, or some other ratio?

5. Should our present highway development procedure be modified in any way if the Federal share for the Interstate System is increased, or should all projects on the Interstate System be initiated and constructed by the State highway departments, in cooperation with the Bureau of Public Roads, as is the procedure at the present time?

6. Will the placing of special emphasis on the Interstate System adversely or beneficially affect the State's capacity to carry on an effective program of construction on the regular Federal-Aid primary and secondary highway systems?

7. Should the Federal contribution to the Interstate System be financed on a "pay-as-you-go" basis or a "pay-later" basis? If neither of these financing plans is deemed feasible, what is an adequate alternative financing plan to complete the Interstate System?

8. In the event that bond financing is deemed the best method of providing for the Federal cost of the Interstate System, what provision should be made to insure payment of the principal and interest?

9. If the bond method of financing the Interstate System is approved, should the bonds be a direct obligation of the United States?

10. Will revenues from the present Federal motor fuel taxes be sufficient (at the present rate) to continue the present Federal-Aid highway program and service the bonded debt? If not, should such taxes be increased for this purpose?

11. It has been proposed that the bonded debt under the suggested "pay-later" plan for construction of the Interstate System be paid off over a period of 30 years. In the 20-year period extending from the completion of the Interstate System to final repayment of the Interstate bonds, what is the prospect for continuing the regular Federal-Aid highway system out of revenues then available?

12. It has been suggested, and it is provided in H.R. 4260, et al., that all Federal motor fuel tax revenues in excess of $623 million annually be made available for paying the Federal share on the Interstate System, including bond retirement and interest payments. The effect of this proposal would be to limit funds available to the Federal-Aid primary and secondary systems to $623 million annually for as many as 30 years. Should funds for the Federal-aid primary and secondary highways be so limited?

13. What will be the effect of introducing the Federal Highway Corporation into our national highway management program, now the joint responsibility of the Bureau of Public

. . . for more details circle 176, page 16

Roads and State highway departments?

14. What will be the extent of the Federal Highway Corporation's functions under subsection 102(d) of H.R. 4260?

15. Should there be control of access on all segments of the Interstate System, or, what would be the effect of unlimited access on the Interstate System highways? Where States do not have necessary legislation to acquire access controls or are unwilling to exercise such rights for various reasons, should the Federal Government acquire the right-of-way and retain sufficient margin of interest to assure control of access on rights-of-way so obtained?

16. To what extent should there be reimbursement to States for toll roads and other primary roads included in the National System of Interstate Highways?

17. Should there be reimbursement for toll roads constructed after 1955 or should eligibility for reimbursement terminate in 1955? What should the reimbursement policy be with respect to non-toll roads incorporated in the National System of Interstate Highways?

18. Should there be compulsory or optional retirement of toll road bonds by States under a program of reimbursement?

Soils engineering course at MIT

A course entitled, "Soils Engineering for Airfields and Highways," will be given at Massachusetts Institute of Technology during its summer session. The course will extend from July 5 to July 15, with nine all-day technical sessions, a field trip and a laboratory tour occupying the two weeks. Lecturers engaged for the course include such outstanding names as G. W. McAlpin, New York State Highway Department; K. B. Woods, Purdue University.

Tuition is $160. Application form must be requested, filled out and returned as basis for admission, the Institute reserving the right to select from applicants on a basis of qualification and experience deemed necessary to benefit from the course. A limited number of special summer program scholarships are available to help pay tuition to persons holding rank of instructor or higher in teaching institutions.

For instruction sheet and application for admission form, address Office of Summer Session, Room 7-103, M. I. T., Cambridge City 9, Massachusetts.

Tournatractor and shovel position and hold giant boulder while electric hoist brings back Rear-Dump body to haul position. Big low-pressure tires of tractor do no damage to existing pavement. Dozer's high blade lift (54") and fast positioning help speed loading.

How Contractor Heintz beat the boulder problem...

On toughest section of Portland-Salem Expressway, extensive beds of 3 to 6-yd. boulders removed by combination of tractor, rear-dumps, and shovel

"You have the toughest section of all..."

R. A. Heintz Construction Company, Portland, Oregon, heard that phrase often during their work on 6.9 miles of the Portland-Salem Expressway between Boone's Ferry Road and the Willamette River.

Not that the grading in their $663,000 contract for turning 2 lanes of existing highway into 4 lanes of expressway involved much dirt. It didn't. Only 200,000 yards, with most cuts less than 5 ft. deep.

But in many places extensive beds of boulders had to be moved. These averaged 3 cubic yards to 6 cubic yards and 12,000 lbs. to 24,000 lbs. each. The "awkward" size. Too big for most shovels to handle alone. Too small to blast economically.

A real problem!

How would you lick it?

Contractor Heintz's solution was to team his two 16-ton LeTourneau-Westinghouse Rear-Dumps with a rubber-tired Tournatractor and a 2½-yd. shovel. As each of the many big boulders was reached, tractor and shovel lifted together, the tractor bracing the rock tightly against the shovel bucket. Meanwhile, one of the Rear-Dumps backed as close to the boulder as possible, its bowl in dump position to minimize lift required. Shovel and tractor teamed up to place and hold each boulder against the Rear-Dump bed. Rear-Dump operator then lowered bowl while shovel and dozer operators followed lift of rear-end to keep load from rolling out. As soon as body reached haul position, Rear-Dump drove away either to waste dump or deep fill where its electric-controlled dump and great strength of the 3 layer, all-steel body made it easy to roll the big boulders out of the bowl and safely over the edge of the fill.

Despite difficult loading, output averaged remarkably high. On one 4000' cycle, where haulers dumped on approach to the Willamette River bridge, each Rear-Dump delivered a load every 10 minutes. Production per unit per 50-minute hour averaged 5 loads (60 to 80 tons).

LeTourneau-Westinghouse equipment can pay off on your tough jobs, too. Let us prove it to you by showing you the machine in action.

Tournatractor—Trademark RT-619-Hb

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

. . . for more details circle 209, page 16

Traffic Safety and Control

Rear-end collisions studied by conference

A two-day conference of the Inter-Turnpike Safety Committee of Pennsylvania, New Jersey, New York and Ohio with a Trucking Associations Committee representative was held recently at Harrisburg.

The primary objective was to discuss uniform compliance by truck operators with regulations as they pertain to rear lighting and rear bumpers. David E. Watson, member of the Pennsylvania Turnpike Commission, was conference chairman, aided by H. W. Morgan, safety director. Also participating were representatives of major trucking firms, the Interstate Commerce Commission, state highway departments, traffic police and organizations dedicated to highway safety.

Mr. Morgan said a Pennsylvania Turnpike survey disclosed that rear-end collisions accounted for 38.2% of all vehicles reported in turnpike accidents. And 42.9% of all nighttime turnpike smash-ups were from this cause. A New Jersey Turnpike survey produced a comparable report, he revealed, with no other single accident cause approaching this percentage.

The Inter-Turnpike Committee is seeking fuller cooperation of truck owners to bring all their vehicles into conformity with legal rear lighting and bumper requirements as established by the Interstate Commerce Commission. The conference was told that the I.C.C. set up excellent standards in this field several years ago, making them applicable to all commercial motor vehicles manufactured after 1952. However, many commercial vehicles of earlier manufacture continue in daily use without those standards, due to lack of owner cooperation and rigid enforcement.

This situation is conducive, the Turnpike Committee stated, to the frequency of cases where burned-out lights, broken or dirty lights or insufficient candlepower have been the sole cause of rear-end collisions.

No new I.C.C. regulations are needed, the committee stressed. "But what is urgently needed is wholehearted, volunteer compliance with the newer regulations by all commercial vehicle operators, regardless of whether or not the vehicles pre-date the 1952 manufacturing deadline."

A truck association spokesman reported that fatal turnpike accidents involving trucks were reduced 40% in the last three years, aided by the association's crusade of self-discipline.

The conference, the 5th such meeting, was sponsored by Morgan for the Pennsylvania Turnpike Commission; Russell S. Deetz, traffic and safety engineer for the Ohio Turnpike Commission; Edmond B. Ricker, traffic engineer of the New Jersey Turnpike Authority; and Arnold G. Fisch, traffic and safety engineer for the New York Thruway Authority.

Texas striping system

In line with standardization of pavement striping throughout the country, the Texas Highway Department expects to give the striping on its main roads a "face lifting" during the first half of 1955. The new pattern will consist of a broken white reflectorized paint line for center lines of two-lane highways and lane lines for multi-lane highways; also solid yellow reflectorized paint lines for barrier lines in no-passing zones.

Trunk highways carrying 2,000 vehicles or over per day will be restriped first.

Relocating The Dalles-California Highway near Madras, Oregon, J. W. Briggs' 2 C Tournapulls handled as much material as a combination of 2 crawler-scrapers, 4 end-dumps, and a 2½-yd. shovel. Material being moved on the 8½-mile, $694,000 job was mostly basalt.

"Lowest-net-cost-per-yard"... check for yourself

Largest scraper in the 10 to 13 yd. (struck) class C Tournapull has the most hp per pound and the highest top speed in its size class. It carries 400 to 1,000 lbs. less deadweight per yard of capacity. This excellent ratio of hp and speed to weight gives you faster loading, faster hauling, faster spreading for greater output per hour. Saving in deadweight lets the C Tournapull drive job-to-job over highway.

A flexible size for handling large or small contracts C Tournapull gives you 16 heaped yards capacity and high speeds for top production on large contracts... yet, with the "C", you can economically handle small contracts at a profit. It is particularly productive on those jobs where short-turning radius and ability to accelerate rapidly are important.

A choice of transmissions Only C Tournapull offers you choice of two transmissions.

(1) Sliding-gear transmission: heavy-duty, simple, reliable — (2) exclusive, patented constant-mesh transmission with low-pressure torque converter for automatic selection of speed ratio to balance load and torque. Select to best fit your haul conditions.

Automatic power-transfer On Tournapull, when one drive wheel starts to lose traction, exclusive power-transfer differential automatically applies more of power to drive wheel on firmest footing. Unit goes loaded through soft and loose materials, sand, or mud where other rigs empty often bog down. You start dirtmoving earlier in spring, keep working through bad weather, add profits later in year.

Less space to turn than any other self-powered scraper You can make a non-stop U-turn, under power, with C Tournapull, in less than 30 feet. This compares to average of 37′ for the 6 other 10 to 13-yd. scrapers.

Faster response than any other control Tournapull is the only scraper operated by electricity. Power and control is transmitted from generator to scraper control and steering motors through electric cables. You have no stresses, no leakage, reduced wear. You get instant action at all times. Only short wire rope connections from winch are needed. Motors are weatherproof, operate effectively in rain, dust, hot or cold weather.

Utilizes front-end weight for traction With steer on drive wheels, pull is always in line of travel. You have no small wheels on Tournapull to "bulldoze" against ruts and stones, to increase wear, lubrication and maintenance. Entire unit requires only 4 tires, 4 wheels, all same size . . . one spare services entire fleet.

Fast-loading, fast-dumping lightweight scraper This scraper is the result of 36 years of experience and 40,000 scrapers. Its all-welded box-beam and channel construction reduces power-consuming deadweight. Needs less cable than other scrapers, loads easily, and dumps quickly.

Simple, less delays, less maintenance, less parts stock Hinges, ball joints, reach rods and other manual steering mechanism eliminated on Tournapulls. Frames, sub-frames, hydraulics eliminated. No springs, no spring lubrication, no spring maintenance. All gearing enclosed, operated in oil . . . all high-speed shafts on anti-friction bearings. Steering and scraper electric-controlled, brakes controlled by air. Field comparisons show that both daily and 100-hour lubrication can be done in less time than on any other scraper — self-powered or crawler-drawn, positive power steer.

Big brakes for safety Tournapull gives you more braking surface per wheel than most haulers have per unit. This assures you of safe control in any weather. Operator safety and confidence are also increased by excellent visibility, low center of gravity.

Easy to operate Power steer, fingertip controls, air brakes, eliminate need for hard work by operator. You have no end-of-shift slowdown. It's easy to learn to turn out big yardage with Tournapulls . . . inexperienced operators can maintain place in high-speed fleet operation.

Versatile for Year-Round Profits Scraper body interchanges with rear-dump, bottom-dump, crane, flat-bed, and logging arch. All units use same electric-control system, brakes, wheels. Interchangeability provides continuous operation on any type job. Fits conditions of any future project. Opens ready rental markets to contractors, mines, quarries, loggers. Spreads investment cost over longer season — a safer future.

Now . . . Entire machine, including engine, serviced by your LeTourneau-Westinghouse Distributor.

Tournapull—Trademark Reg. U.S. Pat. Off. P-734-G-b

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

. . . for more details circle 210, page 16

New Publications

Concrete inspection manual

The American Concrete Institute announces a new edition of the ACI MANUAL OF CONCRETE INSPECTION. The manual describes inspection methods generally accepted as good practice in the concrete construction industry. It is intended as a supplement to job specifications and as a guide in matters not covered by them.

Prepared under the direction of J. W. Kelly, author-chairman of the ACI committee on inspection, this third edition incorporates constructive suggestions gathered through service of the original 1941 edition. New material is presented on such subjects as air entrainment, ready-mixed concrete, and the latest special concrete construction methods. Chief feature of the new edition is a general expansion of explanatory matter so as to be of greater use to the inspector.

The 232-page, pocket size manual meets the challenge of diverse ideas on concrete inspection with careful editing, a concise and readable text, and the inclusion of many references. An attempt is made to explain *why* as well as *how* certain inspection methods are used, making the manual useful to anyone working with concrete, from the laboratory to the construction site.

Although the manual covers inspection in all phases of concrete work, including the making of good concrete and its effective use, the first two chapters on inspection and the inspector are intended especially for those who direct and perform the work of inspection. The third chapter presents some of the basic fundamentals of concrete which concern inspection.

The work of inspection before, during, and after the process of concreting is carefully outlined in separate chapters. Illustrations are liberally used in this section to make details of the work especially clear. An entire chapter is given to the testing of both fresh and hardened concrete, including accepted tests for consistency and air content of fresh concrete; and strength, absorption, and other tests on hardened concrete. Types of records and reports for the various operations on a concrete job are outlined.

Attention is paid to inspection problems which accompany special methods of concreting. Hot and cold-weather construction, ready-mixed concrete, shotcreting, cement-bound macadam, two-course floors, terrazzo, mortar and stucco, masonry, pipe, architectural concrete, painting and coloring of concrete, lightweight concrete, mass concrete, prepacked concrete, tilt-up construction, underwater construction, vacuum concrete, prestressing, and various other special concrete construction are dealt with in a way that familiarizes the inspector with them and explains his role in the concreting work.

For copy and price information, write the American Concrete Institute, 18263 W. McNichols Road, Detroit 19, Mich.

SIMPLIFIED DESIGN OF STRUCTURAL STEEL, By Harry Parker. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 244 pages. Price $5.75. Second edition including the well known Parker Simplified Series. This edition includes newest formulas, working stresses, design procedures.

Chapters cover such items as design of open web steel joints, pipe columns, laterally unsupported beams, new methods of computing equivalent distributed loads for use with safe load tables for beams, etc., etc.

DEFENSE MATERIALS SYSTEM IN AMERICAN INDUSTRY. Published by the Business and Defense Services Administration, U. S. Department of Commerce, Washington 25, D. C. Of interest to administrators and planners, it outlines the role of materials control in the nation's military and atomic program.

BETTER ROADS FOR OUR GROWING NATION. Booklet sums up the panel discussions and papers given at the recent National Conference on Highway Financing, sponsored by the Chamber of Commerce in Washington. Booklet also contains 25 pages of graphs and tables of data on highway and street construction. Price $1.00. Address Transportation and Communication Department, Chamber of Commerce of the United States, Washington 6, D. C.

HOW one contractor solved the scraper size problem

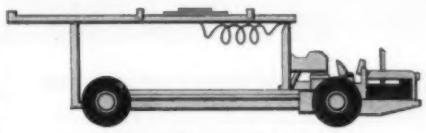
If you've had trouble deciding what size self-propelled scrapers to buy, perhaps the experience of Robertson, Bolen & Fowler, Inc., Buchanan, Virginia, can be of help.

This well-known firm studied all available machines, then purchased four 7-yd. D Tournapulls and later two 16-yd. C Tournapulls. The "C's" they use in any cut or on any job where a large volume of dirt has to be moved. The "D's" work side-by-side with the "C's" on the biggest jobs... with their 28 mph speed, the 7-yd. size has proved ample for profitable use in same pusher fleets. Often, one or more of the "D's" works alone on a small-yardage contract, or as a finishing or cleanup tool. On these jobs, they usually self-load the dirt. When considerable rock is encountered, contractors use the "D" prime-movers with 9-ton rear-dump trailing units. For other work, they could also interchange their "C" scraper for 18-ton rear-dumps, as shown here:

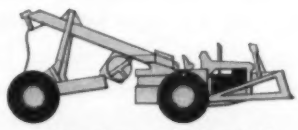
...or the scrapers and rear-dumps for:

18-yd. bottom-dump

10 or 20-ton crane



10 or 20-ton flatbed



or logging arch-&-winch

Each of these 6 trailing units is available to them (and to you) for less than 25% of the cost of the original prime-mover and trailing unit combination. Each gives you a low-cost specialized tool which will do certain types of work at a far lower cost than is possible with general-purpose equipment. Each reduces your equipment inventory and assures you of steady and profitable earnings.

4 machines, 6,915 yds. daily

Take scraper production as an example of Tournapull work-ability. Forrest Cook, Superintendent for Robertson, Bolen & Fowler, figures each of their "C" scrapers hauls as much as 180 loads per 10-hour day on typical 1400′ cycles. On the job pictured—leveling 250,000 yards of clay for the General Electric plant at Salem, Va.—each pusher-loaded "C" carried 13 pay yards per load. Daily output for the 2 "C's" combined averaged 4,680 pay yards.

The smaller, faster-loading "D's", Mr. Cook points out, hauled as much as 214 loads each per 10-hour day, same job, same pusher, same 1400′ cycle. Based on an estimated 5.2 pay yards per load, output for the 2 "D's" combined was 2,235 pay yards daily.

Supt. likes low maintenance

Adds Supt. Cook, "Besides high production, I like the low maintenance of Tournapulls. And they sure can get in and out of wet spots nicely."

Operator likes ease of control

Says Bill King, "I have operated all makes of rubber-tired equipment. I like LeTourneau-Westinghouse rigs the best for ease in operating! They don't make me nearly so tired at the end of the day."

Let us show you what Tournapull output, low maintenance, easy operation and great versatility can mean on your work. Call us for a cost analysis. Then, if you want to prove the figures, ask for a demonstration. We'll have a Tournapull on your job in a few days.

20 mph job-to-job

Both C and D Tournapulls are narrow enough and light enough to make self-powered job-to-job moves. Top speeds in traffic: 28 to 30 mph. Typical Robertson, Bolen & Fowler trip: 40 miles through heavy traffic in just over 2 hours.

Tires last over 3 years

Robertson, Bolen & Fowler's 3 oldest "D's" each have logged 7,500 hours in 3 years... original tires have just been recapped. Other 3 Tournapulls, bought in 1953 and 1954, are running on original treads.

IMPORTANT HP CHANGES
on present production models
"D" raised from 122 to 138 hp
"C" raised from 186 to 208 hp

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

... for more details circle 211, page 16

Armco Handbook — new edition

Armco's well-known HANDBOOK OF DRAINAGE AND CONSTRUCTION PRODUCTS is out in a new edition. This 580-page reference, priced at $5.00, is available by writing to Armco Drainage and Metal Products, Inc., Middletown, Ohio.

Since the first edition appeared nearly a quarter of a century ago, under the title of Handbook of Culvert and Drainage Practice, tremendous changes have taken place in engineering construction — in materials, products and methods.

What is written today by engineers is more of a backsight or a bench mark from which to measure future progress, notes Editor W. H. Spindler in the preface. Armco engineers throughout the world have contributed of their experience and know-how to make this the only book of its kind. As before, it was prepared for engineers in private practice and public service as well as for students in municipal, highway, railway and other branches of engineering.

There are chapters on strength research, strength design, durability studies, durability design, economic factors, design principles and practices, subsurface drainage, special drainage problems, miscellaneous problems and installation instructions.

Most of the chapters are briefly summarized to enable the user to conserve his time in searching for information. The Index has been carefully planned for the same purpose. All illustrations are referred to in the text, helping to clarify many points.

Acknowledgement is made to the various engineering societies and journals, textbook writers, engineering college experiment stations and to others for source materials

PRESTRESSED CONCRETE. Third edition, by Gustave Magnel a member of Royal Belgium Academy, Professor of Reinforced Concrete, University of Ghent. 345 pages 6x9, 330 illustrations. Price $8.00, McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, New York.

PARKING REQUIREMENTS IN ZONING ORDINANCES. Bulletin 99 brings up to date the factual material contained in a 1950 study entitled Zoning For Parking Facilities Bulletin 24. A recent count shows 311 municipalities now having ordinance requirements on the subject. The bulletin reveals the varying standards used by cities to measure the parking space to be provided. Price 75 cents. Remit to Highway Research Board, 2101 Constitution Avenue, Washington, D. C.

ADVANCE BORINGS FOR SOILS DATA

How the highway departments obtain and use subsurface soils and rock data for purposes of design, estimating and plans preparation

IV - Tennessee Practice Summarized

By Edward Burchett
Engineer of Materials and Tests
Tennessee Department of Highways and Public Works, Nashville

A JEEP-MOUNTED soil drill is assigned to each of the four highway divisions into which Tennessee is divided. The purpose of this equipment is to obtain as completely as possible a soil profile that will show depth and width of the various soils on a project.

Soil drills are the auger type manufactured by Mobile Drilling, Inc. The equipment consists of 4 and 6 in. diameter drill sections of 5 ft. lengths, and is capable of drilling from 50 to 75 ft. deep. Drilling is accomplished by three-man crews which follow location parties so that soil and survey data can be combined in the best possible manner for subsequent evaluation.

An important by-product of the soil drilling is that a fairly comprehensive rock profile can be ascertained along with the soil data. A true rock profile, however, is difficult because of the limited ability of the drills to penetrate hardpan and also because of buried boulders and combinations of rock and soil in strata. For example, to the drill operator, a boulder encountered at a depth of 20 ft. will show the same characteristics as a solid limestone shelf.

Test Hole Spacing

Test holes are drilled on 100 ft. intervals for the entire length of a cut, along the centerline of future traffic lanes. Wherever there is a change in soil color or texture, the depth of the change is recorded and a sample is taken for the laboratory. Laboratory personnel subsequently make all soil tests which are required by the Plans Division for the design of a project.

Upon completion of the soil tests, all necessary information from the laboratory and field books are plotted and recorded on a location profile, giving the respective position of each soil type and any rock along the roadway. From such data the Plans Division sets permanent grade and stipulates on the plans the soils to be wasted or to be used for finished grade, as well as those suitable for capping or borrow. Such data also enable the Plans Division to provide a reasonably accurate estimate of the quantity of rock, shrinkage factor or fill material, and the beginning and ending of each soil type. It also enables the division to increase the accuracy of balance points.

Savings to Contractors and State

All soil information obtained by the soil department for a project is available to contractors interested in bidding. The division does not guarantee that its estimates are exact because of the reasons already mentioned. It does use this information in design and has found that the quality of design is much better and far more accurate than it was before soil profiles were available to the designer.

Besides aiding economical design, the most obvious advantage of obtaining detailed soil data has been the elimination of much speculation regarding the percentages of rock and soil on a project. Both the state and contractors have saved considerable money with regard to rock quantities. In the past contractors would risk a profit loss by basing the bid on a small rock quantity estimate which could, during construction, turn out to be 80% or 90% of the material moved. Conversely, the state stood to lose when a high rock estimate would turn out to be very small during construction.

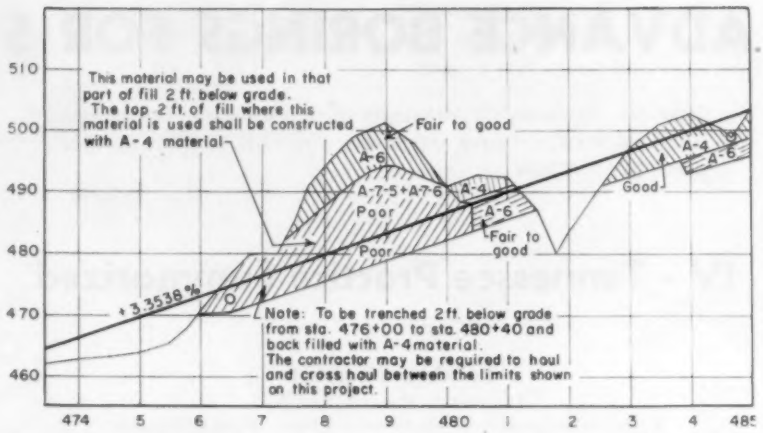
Sample Data

The highway department is convinced that it has been well repaid for its initial investment in soils and rock exploration because of lower bids from contractors who no longer are forced to guess about the soil profile and by building more durable highways owing to improved design of fills and subgrade.

Illustrated is a portion of the plans and profile taken from a recent road project in Henderson County. Because this is a soil-cement subbase project, specifications required that the top

● Jeep-mounted mobile unit in Tennessee's soil drilling equipment fleet.

2 ft. to finish profile shall be type A-4 soil. As a result, soil types A-6, A-7-5, and A-7-6 are required to be undercut and backfilled with A-4 soil to a depth 2 ft. below finished grade. It should be noted that the profile calls attention to the different soils and gives definite instructions for their use or disposal. A prime example of this is the profile segment from station 476+00 to 480+00 as sketched.



● Portion of soil profile shown on plans for a Tennessee soil-cement sub-base project.

V - Colorado's Equipment Adapted to Rugged Terrain

By E. G. Swanson
Staff Materials Engineer
Colorado Department of Highways, Denver

THE wide array of equipment here pictured represents drilling units used by the Colorado Department of highways for the varied soil and material investigations required by the rugged, mountainous terrain in the state.

This equipment is used to locate, explore and develop gravel pits, sources of borrow material, and for soil survey work for obtaining soil profiles. Although no hard and fast rules apply to the frequency of soil profile samples, a minimum of one test boring is taken at intervals of at least 500 ft. in cut sections and 1000 ft. in fill sections. When the character of the soil profile changes, however, intermediate borings are taken until all soil variations are accurately determined.

The soil profile is shown on all plans for the benefit of the contractor, but use of such information is qualified by the following standard plan notation: "Soil data shown on the plans is obtained from the best available laboratory information. This information is shown for the convenience of the contractor and the department does not guarantee the accuracy of these tests. If materials not conforming to the data on plans are encountered during construction, the grading plans shown will be modified, where necessary to secure dense stable embankments."

Principal characteristics and brief description of the equipment illustrated are herewith summarized.

California Earth Drilling Machine. Mounted on a special 4-wheel drive truck, this is a three-way combination unit for churn (precussion) drilling, rotary drilling, and for operating a 2-in. piston soil sampler. A 36-in. rotary table is mounted on the rear of the drill frame for rotating bucket-type round drills. Sizes of buckets are 6, 12, 18, and 24 in. Maximum depth in rotary drilling is 60 ft.; in churn drilling with 6- and 8-in. bits, maximum depth is 200 ft. The California 2-in. piston core sampler is capable of taking cores from 3 to 4 ft. long.

● Buda hydraulic earth drill mounted on 1½-ton Ford truck.

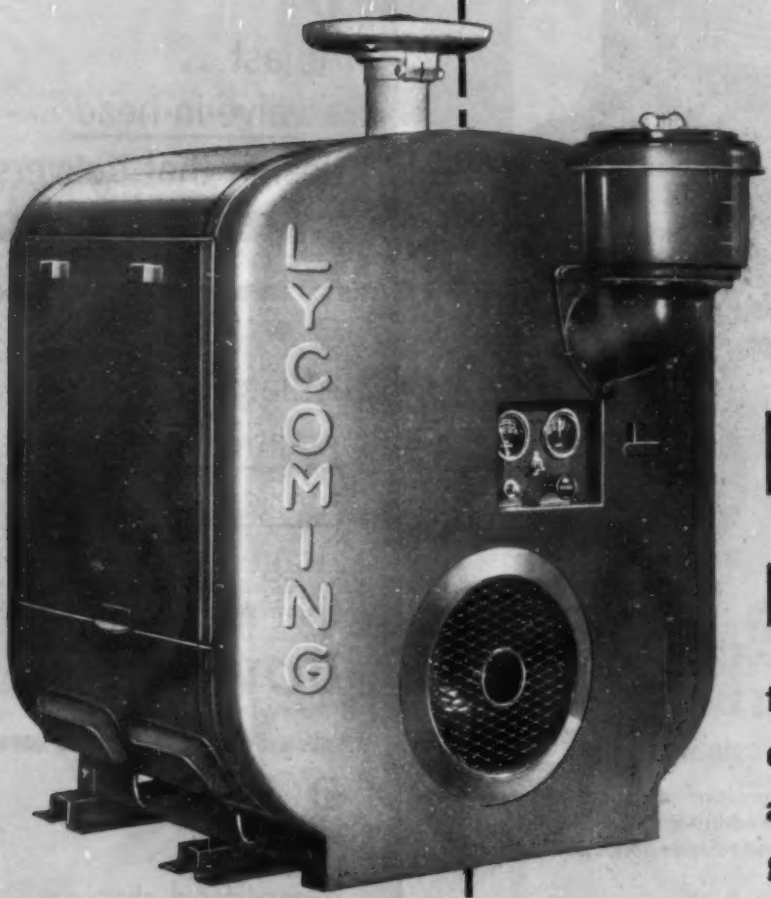
● Williams hydraulic drill mounted on 2-ton Ford truck (Colorado).

At last

a valve-in-head,
air-cooled engine that delivers

FULL POWER

rated at 30 h.p.! delivers 30 h.p.!



Lycoming's new C2-90

for construction field
oil and gas industry
agricultural service
general industrial use

44 years of engine-building experience for aviation, automotive and marine fields stand behind Lycoming's new C2-90. Over $1,000,000 and 5 years of time have gone into its development.

New Lycoming FULL

Now... an amazing new 30-h.p. engine

Lycoming C2-90
2-cylinder 30 h.p.

Lycoming—44 years a leading designer and producer of engines—now presents a new, advanced design industrial engine. In addition to traditional air-cooled advantages of lighter weight, lower cost, all-weather performance and superior endurance, this amazing 30-h.p. unit offers:

- FULL POWER performance—*rated* at 30 h.p.—*delivers* 30 h.p.!
- 1000 hr. continuous-duty life without overhaul.
- Highest horsepower and torque per cu. in. displacement in air-cooled field.
- Dependable operation under all weather conditions.
- Complete interchangeability—identical mounting and shaft dimensions with other major air-cooled industrial engine units in horsepower range.
- Reliability and simplicity for easy maintenance.

First of Lycoming's new family of 2- and 4-cylinder FULL POWER Air-Cooled Engines!

THE

❶ At last... a valve-in-head design that delivers ***FULL POWER***

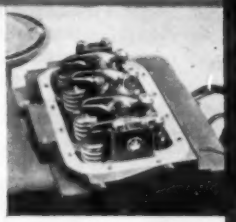
❷ At last... positive pressure lubrication, rugged construction that mean ***LESS DOWNTIME***

❸ At last... simplified design that assures ***EASY INSTALLATION AND SERVICING***

POWER air-cooled engine

with these 3 unique advantages:

FACTS



Valve-in-head design and direct valve porting result in higher efficiency . . . greater horsepower . . . improved fuel economy . . . longer engine life.

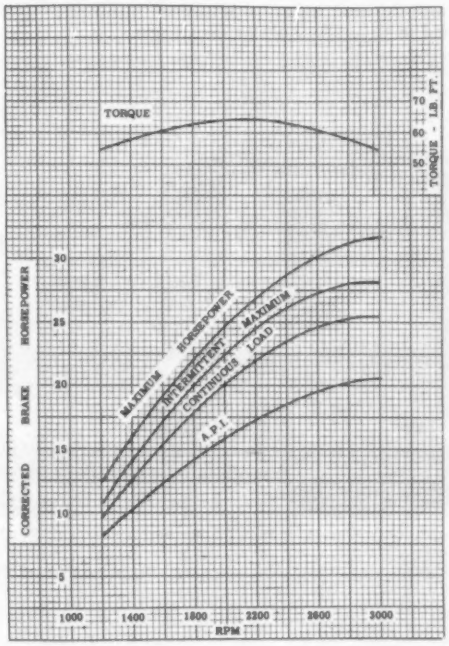
Oil pumped continuously under pressure to all moving parts. Result: less wear and overheating at friction points . . . longer, more trouble-free operation.

Crankshaft is extra-heavy and counterweighted. Drilled passages in crankshaft provide continuous pressure lubrication to bearings. Result: longer life.

- Readily accessible two-piece connecting rods are drop-forged, heat-treated steel . . . easy to install, remove.
- Precision-made automotive type bearings are easily replaceable . . . steel-backed . . . copper-lead lined. No cuts or grooves to break protective oil film.
- Engines have alloy valve seat inserts. Hard-faced positive type valves available—as well as hard-faced valve seats.
- Standard base allows complete interchangeability with other major air-cooled engines in its horsepower range.

THE FIGURES

compare Lycoming's FULL POWER Performance



* Find out how Lycoming's

FULL POWER C2-90

can be tailored to your needs at no extra charge!

Accessories mounted to your requirements:

1. Starter and generator
2. Battery ignition
3. Industrial clutches & reductions (Special crankshaft extensions available)

FOR FULL DETAILS WRITE TO:

DIRECTOR OF SALES ENGINEERING, INDUSTRIAL ENGINES
Lycoming Division, Avco Manufacturing Corporation, Williamsport, Pa.

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LOOK TO Lycoming

DIVISION OF AVCO CORPORATION STRATFORD, CONN.
Manufacturing plants in Stratford, Conn., and Williamsport, Pa.

A member of Avco Defense and Industrial Products organization

DISTRIBUTOR INQUIRIES INVITED

● Truck-mounted 3-way combination "California" earth drilling machine used in Colorado highway department.

● Quick-Way Shovel, model J, mounted on 1½-ton Ford truck (Colorado).

depending upon ground conditions. It is possible with P.K. drill pipe to penetrate and obtain core samples to a depth of 120 ft. by using a 500-lb.

● McCarthy hydraulic drill recently acquired (Colorado).

drop hammer actuated by a cable tool bull wheel. Soundings for bridge foundations are usually made in this manner.

Buda Hydraulic Earth Drill. Used principally for soil profile work and deep gravel exploration, this unit is capable of drilling a 6-in. diameter hole to a depth of 50 ft. with continuous flight auger drilling attachment. With a flat helix auger, it will drill to a depth of 10 ft. The unit is mounted on a 1½-ton Ford truck.

Quick-Way Shovel Model J. For "off-the-highway" investigations of material pits, borrow sources and special roadway maintenance, use is made of this heavy-duty light-weight shovel, mounted on a 1½-ton Ford truck with 4-wheel drive Coleman conversion.

Williams Hydraulic Drill. This drill is mounted on a 2-ton Ford truck with 4-wheel drive conversion and is operated by a separate power unit. A fast, flexible drilling rig, it is widely used for the exploration of proposed material pits, soil investigations, traffic signal installations, and setting guard posts. The unit is capable of drilling to a depth of 20 ft. for hole diameters of 9, 16, and 36 in.

McCarthy Hydraulic Earth Drill. Only recently acquired, this unit will drill 16-in. holes to a depth of 37 ft. and is equipped to drill 8-in. holes to a depth of 60 ft.

AGC at New Orleans—

(Continued from page 71)

pansion of the nation's highways. The meeting endorsed a resolution which assured the public that the construction industry can carry out such an expanded highway program, recommended administration through the Bureau of Public Roads and state highway departments, and that it be carried out under the contract method.

Reports were heard from Bureau of Public Roads deputy commissioner A. C. Clark on future highway construction (reported above) and from M. W. Watson, a director of the U. S. Chamber of Commerce and former AGC president, on chamber activities regarding highways.

Highway Division officers elected for 1955 were Chairman, J. L. Ewell, Lakeland, Fla., and Vice Chairman, Edward O. Earl, Tucson, Ariz.

Committee Reports

The principal committees of the association, which carry out a large part of its work throughout the year, held meetings during the three days preceding the convention opening, and reports were made to the convention through their chairman.

Accident Prevention Committee — Chairman H. B. Alexander, Harrisburg, Pa., reported the number of contractors cooperating in the association's safety program had reached 22.5 per cent of the membership of 1,464 firms that filed their complete record for 1954 with national headquarters. Awards to chapters with outstanding safety programs included 15 first-place merits to members with the best records, 32 second and third place awards and 377 certificates of commendation to companies with no lost-time accidents in 1954; an extension through 1955 of an arrangement with the National Safety Council for furnishing safety materials to AGC chapters and members.

Joint Cooperative Committees

Two joint cooperative committees which the AGC maintains with other organizations to consider mutual problems met in the course of the convention. They were the joint groups

of the AGC and the National Association of State Aviation Officials and American Association of State Highway Officials.

The NASAO-AGC committee heard a report from AGC co-chairman, Max C. Harrison, Pittsburgh, Pa., who noted a $600 million need for airport construction, recommended an increase of federal funds for matching state and local airport funds; suggested study of comprehensive reports "soon to be made available on airport needs by several airport groups." Co-chairman for NASAO was T. K. Jordan, State Aeronautics Commission, Madison, Wis.

The AASHO-AGC committee held an open meeting together with the Highway Contractors' Division and Bureau of Public Roads officials. Discussions centered around a proposed highway expansion program and particularly its financing, acquisition of right-of-way, staffing of state highway departments and construction problems. Co-chairmen were F. W. Heldenfels, Jr., Corpus Christi, Texas, for AGC, and W. A. Warrick, Department of Highways, Harrisburg, Pa., for AASHO.

The Association's 1955 Mid-Year Board Meeting will be held Sept. 28, 29, 30, at Minneapolis, Minn. and the 37th annual convention, Feb. 13-16, 1956, in New York City.

Parkway advertises for roadside contractors

As part of the clean-up work and the beginning of maintenance on the Garden State Parkway, which was opened to traffic as far as Atlantic City during the 1954 summer, was a recent invitation for contractors to bid on roadside work.

Contract sections varying from 15 to 39 miles in length were offered for work covering mowing, weed control, placing top soil, and fertilizing and seeding of the grass areas.

The work is assigned to various maintenance districts along the Parkway. The extent of the total operation involving 140 miles of dual highway is shown by the following quantities involved in the six contracts:

3,430 acres—Mowing
600 miles—Weed control (strip 10 ft. wide)
60,000 cu. yd.—Topsoil (stockpiled and borrow)
2,000,000 sq. yd.—Fertilizing and seeding
31,000 lb.—Seeding
34,500 cu. yd.—Peat humus (stockpiled)
4,600 tons—Peat humus (borrow)
1,750,000 sq. yd.—Mulching (hay)
4,000 tons—Liming

If you're a big contractor who wants a slice of profitable commercial work . . .

If you're a new operator who wants to be sure of beating competition . . .

TEAM UP these two low-cost Cedarapids plants

Here's a team that can't be beat for making yourself a nice slice of profit on small to middlin' jobs . . . the ones that can be a profitable sideline for established outfits. . . or which are sure-fire money-makers to give new operators a flying start in the business.

Your investment is low and your "take-home" is sizeable, because each unit is low in price but high on production. Teamed up, they keep you on top of the job, from gravel, pit or quarry to bituminous surfacing.

Cedarapids Built by IOWA

SINGLE PASS CRUSHING PLANT

The Single Pass Plant shown above produced 40 tons per hour of ¾" rock and gravel, 60 tons per hour of 1", and from 67 to 90 tons per hour of 1½" aggregate. That's the kind of production that lets small operators as well as big outfits make money on road maintenance work, city streets and alleys, small State contracts, base or blanket course jobs, and other jobs where portability and fast set-up are important.

The Cedarapids Single Pass is the most practical plant of this type available. It has plenty of screening capacity, and the hopper and feeder *on the rear end* let you back right up to the nearest gravel bank and start producing *two sizes* of material immediately. Simple design, with few moving parts, keeps maintenance costs low.

Cedarapids Built by IOWA

Model CM "COMMERCIAL" BITUMINOUS MIXING PLANT

Rated at 40 tons per hour, this Model CM "Commercial" Plant averaged 45 tons per hour! The peak production on the job was recorded at *47 tons per hour!* With this kind of output, Model CM owners are turning a tidy profit on jobs such as surfacing city streets, driveways, parking lots, playgrounds and other commercial type work.

The Model CM twin shaft mixing unit can be used alone to produce cold mix, or combined with a 4816 "Packaged" Drier for turning out hot mix or high type bituminous concrete. The use of a Model CGC Gradation Control Unit assures meeting strict State specifications accurately. Addition of a Model BH Feeder completes the set-up for highly profitable operations.

IOWA
MANUFACTURING COMPANY
Cedar Rapids, Iowa, U.S.A.

FOR YOUR BIG JOBS BUY THESE CEDARAPIDS PLANTS

Double Impeller Impact Breaker

Hammermill Secondary and Portable Double Impeller Primary

Model G60 6000-lb. Bituminous Mixing Plant

. . . for more details circle 201, page 16

● Picturing early-spring joint renovation method, typical of that used today in Ohio state highway maintenance.

THE accompanying pictures show one of the numerous joint maintenance crews which are active on Ohio state highway pavements each year during the spring months. This outfit was photographed in April 1954 while working out of the Ashland division on Ohio Route 254.

The procedure pictured here is as follows:

1. The old joint is gouged out with a power unit consisting in this case of a Montgomery Ward garden plow, adapted of a special gouging tooth. Also a wire brush can be attached on the rear axle for cleaning out the joints when desired.

2. Dirt and dust are blown out of the joint by compressed air supplied from a LeRoi 105 compressor mounted on an International truck.

3. Cold rubber asphalt joint sealing compound (Presstite) is applied with a hollow applicator, from an air pump mounted in the truck. The pump is manufactured by Pyles Industries, Incorporated.

4. Paper strips 3 in. wide are placed immediately, using a simple applicator unit as shown in one of the pictures. The paper is to protect the compound from being picked up by traffic. This paper eventually wears away as the compound stiffens and packs down under traffic.

Spring Joint Re-Sealing with Cold Material

● Maintenance crews in various districts are equipped with a converted garden tractor for gouging and brushing old extruded material from joints and cracks.

● (Left): Blowing the joints immediately in advance of sealing. (Right): Sealing compound is delivered to nozzle by pump mounted on a shipping drum in the truck bed.

Eight men in this gang included the driver and one flag man. The crew work one side of the pavement at a time, sealing cracks and joints along a mile or more of pavement per day depending on the lineal feet of joints involved. About 110 gallons per day of compound is applied.

According to C. W. McCaughey, deputy director of highways, Ohio, the operation pictured here is typical except for the sealing of cracks around small slab breaks. Such failed areas are normally removed and rebuilt; the work at the location pictured was an early-season emergency job of a preservative nature pending pavement resurfacing.

Note: The state's methods were briefly reviewed in, "Ohio's New Cold Joint Seal Methods," by C. W. McCaughey, ROADS AND STREETS, June, 1953. A more complete review was presented by Mr. McCaughey in a paper, "Joint Sealing Maintenance Operation in Ohio," at the Highway Research Board's 33rd annual meeting, January, 1954 (Page 355, HRB Proceedings).

Illinois Test Road Details Revealed

THE Bureau of Public Roads will cooperate with the State and Territorial highway departments, the Department of Defense, and the automotive, petroleum, and tire segments of industry in a $12 million road test designed to measure the effects of vehicle weight on roads and bridges.

The planned research, sponsored by the American Association of State Highway Officials and known as the AASHO Road Test Project, will be undertaken in Illinois with direction by the Highway Research Board. The site selected lies in an area conforming to predetermined requirements as to climate, precipitation, frost penetration, and soil conditions, established to insure widespread application of the seasonal test results to particular conditions prevailing throughout the country.

The tests will be made on a 4-lane divided highway constructed as part of an 8-mile relocation of route U. S. 6 between Ottawa and LaSalle. Four test loops, each approximately 7,600 ft. in length, will be provided by connecting the divided roadway with turnarounds. Each loop will have two test lanes with concrete pavement on one side of the dividing median and bituminous pavement on the other. Each loop will be subdivided into sections with pavement varying in thickness to represent existing roads and possible future design requirements. There will be identical variations in the paired test lanes of each loop. Sixteen bridges of varied design and composition are included in the tests.

Million Axle Loads

Three-axle and 5-axle truck-tractor semitrailers will be used as test vehicles. They will operate around the loops in the direction of normal traffic, applying controlled axle loads on the paired lanes in each loop, single axles on the inside lanes and tandem axles on the outside lanes. Six vehicles will be operated at uniform rates in each of the eight test lanes with single axle loadings of a proposed range from 10,000 to 30,000 lb. and tandem axle loading ranging from 20,000 to 50,000 lb. More than a million axle loads will be applied on each section.

The test road, estimated to cost approximately $3 million, will be constructed as a Federal-aid project with financing to the extent of salvage value from apportioned Federal Aid and Illinois State highway department funds. Test features will be financed from the joint-State fund contributed by the several highway departments. An industry contribution of $3 million represents the expense of the test vehicles, gasoline and lubricants for their operation, and the tire equipment.

The Bureau of Public Roads, in response to broadened research authority provided by the Federal Aid Highway Act of 1954, anticipates providing technical personnel, assistance and advisory services instrumentation, and equipment. Direction and administration of the project will be through a Highway Research Board Advisory Committee which will include wide representation of the participants. Direction of the project operations will be under a Project Manager selected by the Board with the concurrence of AASHO.

Right-of-way acquisition by the State of Illinois is already under way, and construction will follow.

The project is planned to provide test results having widespread application in the regulation of loads for the protection of existing highways and bridges, as well as to design standards for future facilities.

DIGEST of Current Engineering Literature

By JOHN C. BLACK, Associate Editor

"Stud welding" ties road slab to beams

Two long viaducts in Glamorganshire, Wales have 9-in. deck slabs with reinforcement fastened to steel floor beams by "stud welded" hooks. Drilling was objected to in making the fastenings because it would weaken beam flanges; and manual arc welding was ruled out because of possible heat distortion and the time required for the operation.

The special looped studs were welded in pairs to the floor beams ("cross girders") at 4-ft. intervals as shown. The material was ⅝-in. rod, and the inside loop diameter about 1⅝ in. Welding equipment consisted of a transformer-rectifier, a portable controller, and a hand tool. The weld cycle required only a few seconds. Approximately 10,000 studs were set on one of the bridges alone, and all work was regarded as highly satisfactory.

Straight reinforcing bars were passed through the stud loops, and the hooked ends of the longitudinal bars anchored to them. Considerable savings were claimed in time, material and labor.

Another application occurred in the attachment of cable ducts to the central main girder, where a gutter was formed between the slabs of the main roadways, and this had to be done with the slabs already cast in position.

The method is illustrated in Fig. 2.

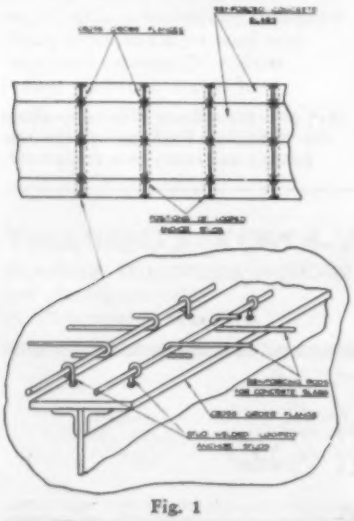


Fig. 1

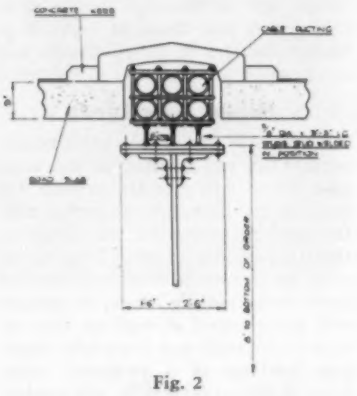


Fig. 2

Three ⅝ in. diameter threaded studs, varying in lengths from 3 ins. to 5 ins. (according to the camber of the bridge) were stud welded to the central girder. These groups of three were spaced at intervals of about 10 ft. A square plate, drilled to suit the stud, was then supported on each stud by means of a nut. With this arrangement, the height of the cable bracket could be adjusted so that the duct remained straight in spite of the varying camber of the bridge. When correct heights had been determined, the excess length of stud protruding beyond the plate was burnt off flush, and the cable bracket arc welded to the supporting plates. Again substantial economies were claimed.

It is noted that in the United States the Illinois State Highway Department has used the process for fastening wire mesh to steel deck bridges as a basis for anti-skid surfaces; while on the bridge over the Ringvaart near Sloten, Holland, wood deck planks were fastened direct to girders by stud welding.

"Stud Welding in Bridge Construction," ROADS AND ROAD CONSTRUCTION, *68 Victoria St., London, S. W. 1, England, January, 1955.*

Self-luminous markers

New uses of self-luminous markers are made possible by Navy experiments using the radio-isotope Strontium-90. Luminance has been increased as much as five times that of previous radium-excited markers, and color range greatly extended. The increased power and color range of the markers widen their usefulness in marking vehicles, decks, bridges, roads and buildings. The report of this research describes procedures and instruments used in measuring luminance. Charts show photometric measurements of brightness and visible distances of colors tested.

"VISIBILITY AND USES OF SELF-LUMINOUS MARKERS," *Naval Research Laboratory. 1954. 16 pages, with charts and schematic diagrams. Available from Library of Congress, Publication Board Project, Washington 25, D. C. Microfilm $2.00. Photocopy $2.75. Code No. of Report, PB 113971.*

Big rock drills — special wet ground treatment

The above generally unrelated subjects come together in a description of construction operations by the Guy F. Atkinson Co. at the Cherry Valley dam in the high Sierras of California. Neither the drills nor the ground treatment fit the "average" road job, but each is interesting on its own account, and could, in special cases, be applied on road or airport work.

1. Heavy blasting of granite to provide rock fill was speeded economically by eight of the new Joy TWM-2A, air-propelled "Challenger" wagon-type drills — the largest hammer drills so far produced. Hole depths ranged from 20 to 60 ft., with diameters from 3⅛ to 4½ in., in an "experimental" block of 500,000 cu. yd. The remaining 2,500,000 yards will be a precise operation of high productivity per pound of explosive.

The 3-wheeled drill chassis unit is self-propelled by air motors. It features simultaneous drilling and blowing and force-feed lubrication. Each drill requires about 500 cfm at 80 to 90 pounds pressure for best performance. Size of rock is well controlled by blasting techniques, including both millisecond delays and simultaneous round firing. A shop is maintained on the job for threading, heat-treating, and otherwise keeping drill stock and other items in condition.

2. Material for the 3,000,000 cu. yd. impervious dam core is granite in various stages of decomposition, requiring varying amounts of water for maximum density at optimum moisture. The deposit from which it is taken is, as a whole, too wet, "and has required three operations to solve the problem (a) the borrow pit has been extended in area to expose more ma-

terial to natural air drying, (b) extensive use is being made of plows, spring harrows, and Ateco rippers to turn over the ground and speed up the drying, and (c) drain ditches 15 to 20 ft. deep are being dug to drain off bedrock springs."

"At the damsite, the impervious fill material is deposited in 8-in. layers that are compacted to a 6-in. thickness. . . . Specifications for compaction are based on the modified AASHO test whereby 57,375 ft. lb. of compactive effort is applied to samples (as against 12,375 ft. lb. for the standard AASHO test). Any series of 10 consecutive tests on the fill must meet these requirements: 100% of the tests shall have a field density greater than 90% of the maximum density, 90% greater than 91%, and 50% greater than 94% (of the same terms). To meet these requirements the contractor has TD24s hooked up to three sheepsfoot rollers and one 100-ton Southwest pneumatic roller, while a D8 pulls a 50-ton WISCO pneumatic roller.

"In spite of normal precaution at the borrow pit, some oversize material is hauled to the damsite. This is very effectively removed however by two D8s equipped with rake teeth on the bulldozer blades that either push the oversize material to the edge or pile it up to be picked up by a DW20 on a return trip. One D8 is also equipped with a harrow to loosen the top 2 in. of a lift compacted by the final pass of the 100-ton roller — this is to bond two lifts together."

The obviously complicated haulage problems are described.

"Largest Hammer Drills in Action at Cherry Valley Dam," WESTERN CONSTRUCTION, *609 Mission Street, San Francisco 5, Calif., September, 1954.*

"Steel jetties" for river bank protection

Light, open-work steel units placed on eroding banks commonly afford better and cheaper protection than heavier constructions such as rip rap, rock-filled cribs or piles. The effect of these units, commonly referred to as "steel jetties," is to slow current and cause deposit of silt. Where, as in some cases, a new bank line is established and later scoured out, causing the jetties to sink, another row of jetties is simply placed on top of or a little behind those which are buried. It is noted, however, that in more than a quarter century of experience, failures have been few and in most cases only partial.

This report treats briefly of jetty

location and of the design, spacing and installation of the component units. Some types are patented.

Some existing jetties have been in service for 30 years, and a life expectancy of 50 years or more is regarded as reasonable. Lacings of corrosion-resistant rods rather than wire have an obvious advantage.

Six photographs of installations, three detail drawings of units, and one location plan are included.

Report of Committee on Roadway and Ballast, Assignment 3, "Natural Waterways: Prevention of Erosion," L. H. Jentoft (chairman, sub-committee), R. A. Anderson, M. B. Davis, F. H. McGuigan, and A. J. Wegmann, AMERICAN RAILWAY ENGINEERING ASSOCIATION BULLETIN, *Vol. 56, No. 521, February, 1955, American Railway Engineering Association, 59 East Van Buren St., Chicago 5, Ill.*

Lateral load tests on piles

This symposium constitutes presumably the most comprehensive study to date on resistance of piles to lateral forces. The authors deal not only with current tests and analyses but with valuable earlier work heretofore unpublished. Titles, authors, and selections from major findings follow.

RESISTANCE OF LONG HOLLOW PILES TO APPLIED LATERAL LOADS, by G. A. McCammon and J. C. Ascherman. Paper relates to reinforced concrete piles driven into the bottom of Lake Maracaibo, Venezuela, to support oil drilling rigs. Tests date from year 1946. "The results indicate that the plastic clay into which the caissons penetrate acts as an elastic medium when resisting lateral forces. Also, the point of maximum moment occurs very near the surface of the soil, even though the soil penetration is large."

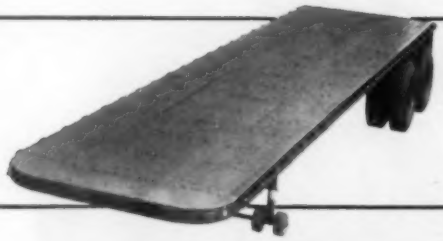
LATERAL LOAD TESTS ON GROUPS OF BATTERED AND VERTICAL PILES, by Lawrence B. Feagin. Tests at Lock No. 25, Mississippi River, by U. S. Army Engineer Corps in 1936. "It was found (a) that groups of battered piles combined with vertical piles are more resistant to lateral loads either against or in the direction of the batter than are corresponding groups of vertical piles; (b) that the resistance to a lateral load against the batter is greater under a vertical load than for no vertical load, whereas for a lateral load in the direction of the batter, the resistance is substantially the same either with or without vertical load; (c) that the resistance to lateral loads in the di-

(Continued on page 132)

New Trailmobile Dump Trailer . . .

tandem axle, 25 ton capacity. Rugged "workhorse" on toughest jobs! Hi-tensile steel body has light weight . . . tremendous strength. Tailgate opens top or bottom. 3-stage hoist mounted to push directly under load. Also built with single axle, 15 ton capacity! Power Fifth Wheel available when you require pump and tank on trailer.

Ease the squeeze on profits with cost-cutting



TRAILMOBILE PLATFORM TRAILERS with famous Trailmobile Tandem give years of low-cost hauling! Handle maximum loads of lumber, pipe, sheet metal, "I" beams. Main frame rails are full 15" deep for extra load-carrying strength! "Cantilever" outriggers supported by cross-members every 18" for still greater ruggedness! Also available as a two- or four-wheeler flat, without tandem!

TRAILMOBILE ASPHALT TANKS feature advanced design, rugged, hi-tensile steel construction, big capacity. Depend on them for extra years of troublefree service and a higher price at resale time.

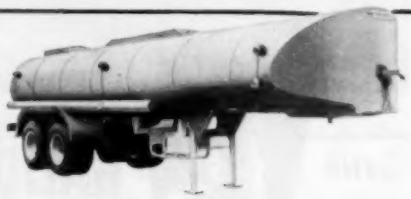
Illustrated —

TRAILMOBILE LOW BED TRAILER MODEL FR

hauls really back-breaking loads with ease! Electrically-welded throughout for extra strength and long life! Models available with trunnion axle assemblies, enclosed rocker beams, level or drop platforms. Capacities from 15 to 35 tons!

TRAILMOBILE HEAVY-DUTY LOW BED TRAILER MODEL FC. When you've got to move shovels, road rollers, machinery and other equipment up to 75 tons, you need a Model FC Trailmobile trailer! Built *rugged* with best quality steel and other materials, electrically welded throughout, keeps upkeep costs low! Capacities from 45 to 75 tons!

NEW, LIGHTWEIGHT OPEN TOP IP (INTEGRAL POST) VAN combines all-steel construction, strength and light weight! New IP (Integral Post) construction features integral posts on 12" centers . . . only 7" apart! This lets you haul bulky, concentrated loads with ease! Open top construction allows for crane-loading!



TRAILMOBILE BULK COMMODITIES TRAILER

handles any and all materials that will flow . . . asphalt, core sand, aggregate and other bulk commodities. Fibre-glass insulation provides high insulating efficiency, saves weight.

Trailmobile SC Bulk Cement Trailers eliminate bags, barrels, storage and rehandling . . . saved one user $177 on each load (37½¢ per bag)! Speeds handling . . . unloads 118 barrels of dry cement in 15 minutes! The Trailmobile's lighter weight means lower operating costs, additional payloads.

TRAILMOBILES

. . . Engineered to Outwork and Outlast them all . . . a finance plan to suit your needs!

It's great to be low bidder—if there's still room for a profit! So when you figure jobs, figure all the ways a Trailmobile trailer can help you cut costs . . . save man-hours . . . bring the job in on time!

Trailmobile Trailers cut down-time to the bone. They're built with brawn and muscle to take all the abuse you can give them! And they're always in demand in the used equipment market, too—contractors everywhere know them to be reliable and efficient no matter how rough the job turns out to be.

Whatever your hauling requirements, there's a rugged Trailmobile *right and ready* for you! See the yellow pages of your local phone directory for the location of your nearest Trailmobile branch office and able assistance in solving your hauling problems! Or, write us direct . . . use coupon below.

TRAILMOBILE USED TRAILERS *For Every Purpose!*

Many contractors use Trailmobile Van Type Trailers as mobile or permanent field offices, drafting rooms, payroll and watchmen's shacks. Also for tool and equipment storage, transportation of heavy equipment from site-to-site, sleeping quarters, and many other uses! Low in cost, these used Trailmobile Trailers quickly pay for themselves in the time and money they save on shanty construction and erection at each new site!

Other top-value Trailmobile used trailers include:

TANKS . . . *for water, gasoline, oil, asphalt, bulk cement storage and transporting.*

FLATS . . . *to hold and haul air compressors, pipes, lumber, poles, bulky machinery, digging equipment.*

DUMPS . . . *for hauling up to 25 tons per load.*

All sizes . . . lengths . . . and types available!

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. . . for more details circle 268, page 16

Friendly Trailmobile Branch Offices Throughout The U. S. To Assist You With Your Hauling Problems! Mail Coupon For Further Information!

TRAILMOBILE INC., Cincinnati 9, Ohio

Please rush literature on following type trailers:

_____BULK COMMODITIES _____VANS _____DUMPS

_____OPEN TOPS _____PLATFORMS _____LOW BEDS

_____ASPHALT TANKS

☐ Send us more information on _____ type used trailers.

☐ Please have your representative call without obligation.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

170 cu. yds. per hour on 1600-ft. cycle

Tulsa contractor averages 170 cu. yds. hourly with TD-24s and B-250 INTERNATIONAL scrapers on 1600-ft. cycle while helping cut 24 per cent off length of Oklahoma highway

The D. W. Falls Construction Company of Tulsa holds the prime grading contract for 7.6 miles of Oklahoma State Route No. 20 between Hominy and Ralston. They were able to make cost-cutting short cuts in earthmoving operations on the project that cut travel distance 24 per cent by using three INTERNATIONAL TD-24 drawn B-250 scrapers moving 27 cubic yard-heaped loads, and push-loaded by a TD-24 crawler.

Take it from Supt. Bob Derington:

"It's really surprising how much dirt these big scrapers will move per day. Under fairly good working conditions, each unit gives me a day-after-day average of 170 cu. yds. of dirt an hour while working a 1,600-foot cycle."

You can get pay-off performance by hitching INTERNATIONAL scrapers to the TD-24—still the Champ of the crawlers with 161 drawbar horsepower. That's the kind of hook-up that loads, hauls and spreads faster than any other combination . . . day after day . . . year after year. Just call your INTERNATIONAL Industrial Power Distributor for demonstration proof. He'll bring the combination you specify anywhere, anytime so that you can see why INTERNATIONALS make every load a payload.

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

INTERNATIONAL
INDUSTRIAL POWER
MAKES EVERY LOAD A PAYLOAD

INTERNATIONAL HARVESTER

SMOOTH-WORKING TEAM. Four INTERNATIONAL TD-24 crawlers and three B-250 scrapers delivered a total of 510 cu. yds. hourly on the 1,600-foot cycle for D. W. Falls.

TD-24 POWER FRONT AND BACK PUTS these kinds of 27 cu. yd.-heaped loads in the INTERNATIONAL B-250 scraper in a matter of seconds for D. W. Falls on the company's 7.6-mile project requiring 250,000 cu. yds. of excavation.

EASY, FAST HAULING of heaped loads is assured with this equipment combination. The B-250 scraper requires minimum drawbar pull and has a low center of gravity that gives outstanding stability on side slopes like this.

. . . for more details circle 199, page 16

Engineering Digest

(Continued from page 126)

rection of the batter generally exceeds that for loads against the batter for similar pile group arrangements, either with or without a vertical load; and (d) that a group of piles battered in both directions is more resistant to lateral loads than a group battered in one direction."

BEARING PILES SUBJECTED TO HORIZONTAL LOADS, by L. T. Evans. Tests of steel H piles at site of Sepulveda Dam, Los Angeles, Calif., from a comprehensive report by U. S. Engineers, dated April, 1940. These tests provided necessary information for designing the structure, but the author does not regard them as justifying general conclusions.

THE RESISTANCE TO LATERAL LOADING OF SINGLE PILES AND OF PILE GROUPS, by Gregory P. Tschebotarioff. The paper is based on work with models at Princeton Univ. in 1945, and in Japan in 1938 and 1939. "The results of model tests on single piles and on three-pile and seven-pile dolphins show that the resistance per pile to lateral loads decreases appreciably with an increasing number of piles in a group. . . . The location of a pile within a group affects materially the magnitude and the nature of stresses to which it is subjected."

THE LATERAL LOAD CAPACITY OF TIMBER PILE GROUPS, by J. O'Halloran. Tests were made in 1928 for the design of pile anchorages for a sliding crib at a Canadian paper mill dock. The ground was wet sand. Results indicated that each group of 4 piles could sustain a load of 100 tons indefinitely without appreciable movement. Loads of 200 tons caused a 12½ in. movement. In the quarter century since the installation was made, the wharf movement has averaged not more than ⅜ in. per year.

LATERAL LOAD TESTS ON PILES FOR DESIGN INFORMATION, by A. A. Wagner. The Bureau of Reclamation conducted tests on individual piles in scattered locations and widely differing soils. "The following broad general conclusions are reached:

1. Overdriving reduces the lateral resistance of a pile.
2. Increasing the length of a pile does not improve its lateral resistance, provided the pile is imbedded sufficiently to prevent movement in the lower portion.
3. The lateral resistance of a pile in poor material may be increased by increasing the length.
4. Increasing the size of a pile, increases lateral resistance.
5. The ultimate penetration resist-

ance of bearing capacity may not be an indication of the lateral resistance of a pile.

6. The lateral resistance of a pile group, in which the free ends of the individual piles are rigidly tied together, may be equal to (for small deflections, ¼ in. or less) or greater than (for larger deflections ¼ to ½ in.) the combined lateral resistance of the individual piles in the group.

7. The strength and type of material within the first 20 ft. of depth has considerable effect on the lateral strength of a pile.

8. The lateral resistance of a pile may be improved by the application of a vertical load."

LATERAL LOAD TESTS ON VERTICAL FIXED-HEAD AND FREE-HEAD PILES, by Sol M. Gleser. Tests were made to determine the action throughout its length of a laterally-loaded pile with head incased in a concrete monolith. Also described is a test on a single free-head vertical pile. These tests, like those covered in the paper by Mr. L. B. Feagin, were made at Lock No. 25 in the Mississippi. Major conclusions include the following:

1. A pile with head so fixed as to constrain it to remain vertical will assume an S or ogee shape when subjected to lateral load.

2. Irreversible deflections occur in portions of the soil surrounding a pile under lateral load, thus leaving portions of the pile unsupported by soil after load is removed.

3. Soil at the site did not act as an elastic solid.

Caution is voiced against depending on single tests without studying the over-all soils picture.

PILES SUBJECTED TO LATERAL THRUST, Part I — Measurement of Earth Pressure and Deflection Along the Embedded Portion of a 40-ft. Steel Pile, by H. G. Mason and J. A. Bishop; Part II — Analysis of Pressure Deflection, Moment, and Shear by the Method of Difference Equations, by L. A. Palmer and P. P. Brown. The tests and computations of Part I of this paper constitute one phase of a broad research program on piling by the U. S. Naval Civil Engineering Research and Evaluation Laboratory at Port Hueneme, Calif.

Part II utilizes the data of Part I to show the effects of different variables, and to outline applications in design and methods.

"The following conclusions are restricted to the conditions of tests as described in Part I:

(1) There is good agreement between the measured and theoretical earth pressures and pile deflections.

(2) The most realistic earth-pressure-distribution curves are obtained

with n values that are between zero and unity.

(3) Laboratory tests have thus far not been adequate for determining suitable values for k and n. Those values can be determined from lateral load tests.

(4) The variables, stiffness factor, height of thrust above grade, width of pile, and depth of pile embedment, have surprisingly small effects on the magnitude of the maximum moment and its location in the pile.

(5) The magnitude of the maximum bending moment is much less than usually supposed and as usually computed.

(6) The depth below grade of the maximum moment is much less than is commonly supposed.

(7) The magnitude of the peak earth pressure far exceeds the passive earth pressure as computed from classical earth pressure theories."

"Symposium on Laterial Load Tests on Piles," ASTM SPECIAL TECHNICAL PUBLICATION No. 154 *(102 pages, comprising the first seven of the above listed papers) and "Supplement to Symposium on Lateral Load Tests on Piles,"* ASTM SPECIAL TECHNICAL PUBLICATION No. 154-A *(44 pages, comprising the two papers under heading "Piles Subjected to Lateral Thrust"), American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., 1954 and 1955.*

Heliports in cities — a forward look

Helicopter access to central urban areas is a fast-coming need, for which major pioneering is still to be done.

In this 4-page article the authors make a frankly speculative approach to the problems of location and design of landing areas. They assemble pertinent information from operating experience to date, analyse some of the problems, and offer tentative solutions. No attempt is made to set up standards. "Prevailing opinion, with which the authors agree, is that to propose standards at this time would be premature."

Present scheduled helicopter service in this country consists in mail service in the metropolitan areas of Chicago, Los Angeles, and New York; passenger service at New York and Miami; and express service at New York, Miami, and Los Angeles. Europe has two scheduled services. It is noted that the American Air Transport Association has forecast that, "in the United States, domestic helicopter passengers will account for about 11 percent of all scheduled air passengers by 1960, and 24 percent by 1970, or 6 million and 22 million passengers per year respectively."

Helicopters currently in civil use in the country have speeds of about 90 mph and a maximum capacity of 10 passengers. It is expected that larger craft will become available about 1956.

"The types of service that helicopters can render appear at present to include:

1. Inter-city operations up to 300 miles.
2. Service from a city center to an airport in a large metropolitan area.
3. Suburban service in large metropolitan areas, including commuter service.
4. Connecting service between airports in the same metropolitan area."

Characteristics of 13 transport helicopter models — passenger capacity, maximum dimension, weight, wheel load, etc. — are tabulated. Four of these models are listed as in service, one in test and eight in development. Among the latter are three of the "compound" type planned for speeds of 200 mph or more. Gross weights in the table vary from 2 to 20 tons.

The special requirements of roof locations and ground locations for landing are considered, including approach path and possible emergency landings.

"It has been suggested that the way to attack the problem is to determine the size of heliport that is practical and economically feasible in a city center and then build the necessary performance into the helicopter to enable it to operate from this area. This suggestion has merit; unless the heliport can be kept within reasonable dimensions it will have to be located in a suburban area just as an airport is.

"For the single-engine helicopters currently in commercial use, such as the S-55, a take-off and landing area approximately 200 to 250 ft. square will suffice."

"Urban Heliports Are on the Way" by Robert Horonjeff, A. M. ASCE, Lecturer and Research Engineer, Institute of Transportation and Traffic Engineering, University of California, Berkeley and Howard S. Lapin, Research Associate, Institute for Urban Studies, University of Pennsylvania, Philadelphia.

CIVIL ENGINEERING, *33 W. 39th St., New York 18, N. Y., February, 1955.*

L. STERLING HEDGPETH has been appointed Chief of the Specifications and Materials Section, Construction Branch, Bureau of Public Roads, Washington, D.C. Recently he was in Turkey where he was a member of the Public Roads advisory group.

Personals

H. S. Fairbank to retire

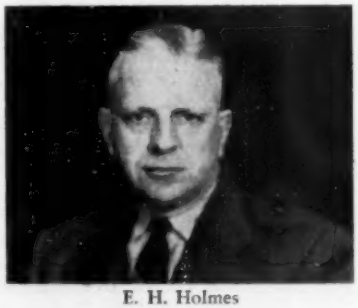
H. S. FAIRBANK, deputy commissioner of Public Roads in Washington, plans to retire soon. He is to be succeeded by EDWARD H. HOLMES, who until recently was chief of BPR's Highway Transport Division.

Mr. Fairbank's career ranks him as one of the top highway administrators of our times. During his 45 years with the Bureau he has contributed to every segment of highway engineering and received high honors.

H. S. Fairbank

In 1935 Mr. Fairbank pioneered the State Highway Planning Surveys, which assembled data invaluable in providing facts to guide highway improvement and financing. Mr. Fairbank, during this career, also has been responsible for three highly significant studies on highways carried out at the request of Congress. These were "Toll Roads and Free Roads" in 1939; "Interregional Highways" in 1944; and "Highway Needs for the National Defense" in 1949. The 1944 study was followed by federal legislation authorizing the National System of Interstate Highways.

Among awards received by Mr. Fairbank are the Bartlett Award (1947), the Department of Commerce Gold Medal for exceptional service (1950) and the Roy W. Crum Award (1953).



E. H. Holmes

HARRY C. COONS, Deputy Commissioner and Chief Engineer of the Michigan State Highway Department, died recently at age 68 after a long and distinguished career.

A former contractor, Mr. Coons, also was secretary of the Michigan Road Builders Association (1928-33), engineer for the Ingram County Road Commission in Michigan, and since 1933 was the state's top highway engineer. He was nationally known for his activity in connection with modern road design.

FAGAN B. MASON is appointed expressway engineer for the Texas Highway Department at Corpus Christi. Previously resident engineer at Corpus Christi, he has been with the department for thirty-two years.

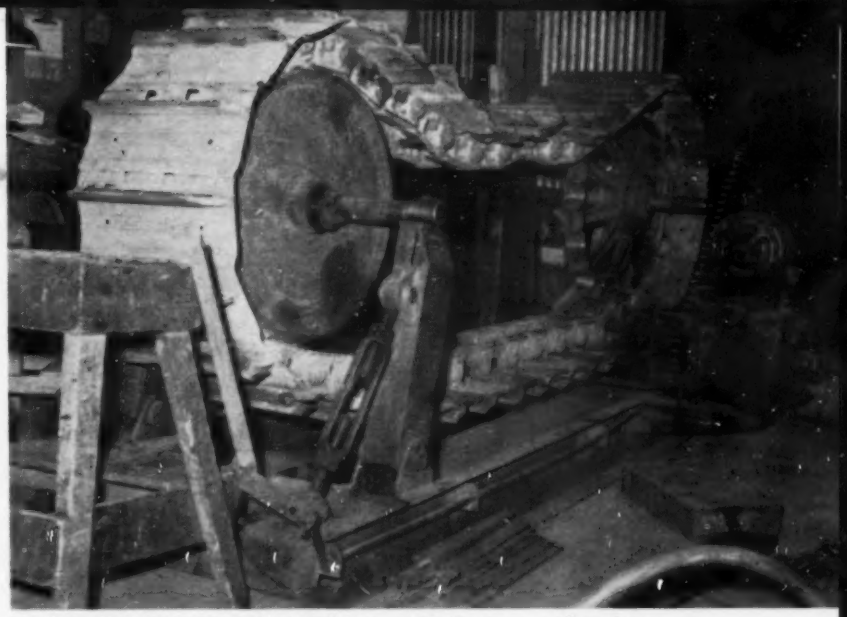
N. A. STAPLES, assistant chief engineer in charge of maintenance for the Pennsylvania Department of Highways, and deputy secretary of highways, has resigned to become associated with the Florida Turnpike Commission.

THOMAS D. SHIELS has been appointed District Engineer for the Austin (Texas) office of The Portland Cement Association, succeeding James D. Piper recently promoted to a Vice Presidency of this organization.

HAROLD G. GARNER was been made District Engineer of the association's Kansas City, Missouri, office and Kenneth B. Lucas at the Omaha office on a shift resulting from the retirement of Mr. Edward J. Muller at Kansas City.

● Joseph J. Lawler has been made Secretary of Highways in the cabinet of Pennsylvania's new governor, George Leader. He has held various posts in Pennsylvania State Government work.

NEWMAN E. ARGRAVES has been apppointed State Highway Commissioner of Connecticut and HOWARD S. IVES, Deputy Highway Commissioner. Mr. Argraves, who succeeds G. Albert Hill, headed a consulting firm under his own name at New Haven.



● Fig. 1. Unique fixture used in Isbell Contruction Company welding shop for rebuilding track grousers.

Fixture Aids Grouser Rebuilding

IN THE MAINTENANCE shops of Isbell Construction Company at Reno, Nevada, worn trackpad grousers are renewed manually using the novel fixture shown in the accompanying photograph.

As described in "Fusion Facts" by Stoody Company, steel bar stock of ½" x 1¼" size is torch-cut to length and welded to worn grousers with high-tensile, low-hydrogen electrodes. During this operation an entire track is set up in the fixture as shown in Photo No. 1. Welders are stationed at each end to permit down-hand welding on either side of the bars. With this arrangement welding time is cut in half and handling is simplified. After new bars have been welded to worn grousers, they are "topped" with a single heavy stringer bead of coated Stoody self-hardening rod.

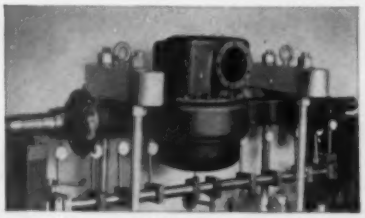
The jig itself simulates an actual installation. An idler supports one end of the track and the opposite end is carried on a driven sprocket. Large turnbuckles are used to adjust the position of the idler for track or varying lengths.

Renewing of grousers obviously could be accomplished on the tractor, but at a sacrifice of valuable production time. At Isbell's ample spare parts bridge this gap and welding is done during slack periods, as a result equipment down-time and maintenance costs here have been sharply reduced.

Isbell Construction Company, one of the oldest and largest contracting firms in Nevada, has a large equipment inventory working in several Western states. Maintaining crawler-type running gears is one of the routine jobs in the company's shop. Such parts as idler rolls, track rolls, and rail links are regularly rebuilt by automatic electric welding, a method that is now in common use throughout the country. The rebuilding of worn trackpad grousers, however, is done manually as described above.

● Fig. 2. Superintendent Howard Keele, of Isbell's, and Bob Hand of Stoody Company, inspecting a grouser that has been newly faced.

Matched to your toughest conditions. Steep grades! Heavy loads! Muddy going! Every adverse condition is duplicated in our "Torture Chamber" to produce axles that can "take it". Stock axles are picked at random and subjected to the equivalent of a "chuckhole" shock every 4 seconds, 24 hours a day, for months on end. Another test simulates an uphill pull 3,000 miles long. Only tests as rugged could produce axles so tough.



GREATEST ADVANCE SINCE

exclusive double-reduction design 2-speed gear ratio spread!

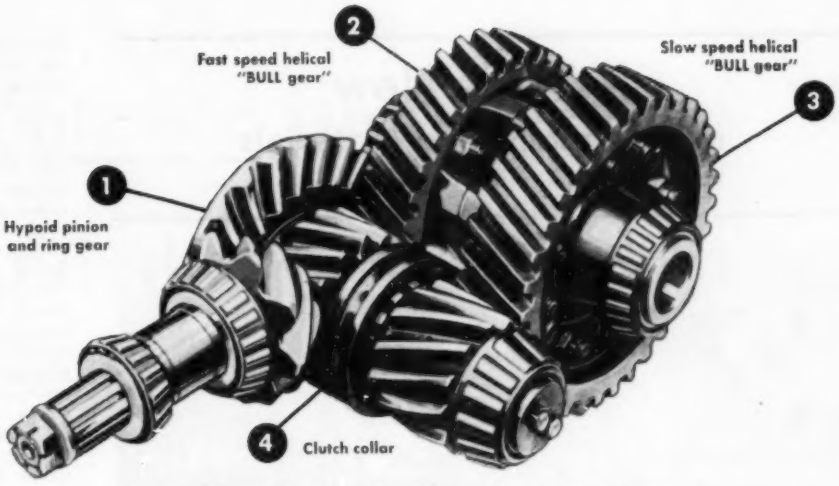
Tailor-made power exactly to your trucking needs with Timken-Detroit!

Unequalled flexibility! TDA 2-Speed Axles, give an almost *unlimited* choice of gear ratios. The Timken-Detroit design is so simple and basic, that an ordinary mechanical change lets you tailor power exactly to your trucking needs. Where other 2-speed axles limit you to only a single gear spread of 37%, TDA offers a range all the way from 28% to 49%.

TDA meets varied needs! The variety of hauling conditions that today's trucks must meet call for maximum speed and power flexibility. Other 2-speed axles are just too limited to meet this need. On the other hand, TDA's simple double reduction design gives complete flexibility. Gear ratio can be easily changed without weakening the axle unit in any way.

How you benefit! TDA not only gives you a much wider power range, but also, all the advantages of a stronger, sturdier, smoother operating design. Since helical "Bull" gear sets operate independent of one another, there is no overheating even after indefinite running in low speed. Bigger huskier TDA parts last longer, stand up better under tough usage.

Less down-time, longer axle life, fewer repairs, higher fuel economy, lower operating costs and higher profits. These are some of the important reasons why so many leading manufacturers and operators everywhere specify Timken-Detroit 2-Speed Axles.



How the exclusive double-reduction design of

TDA 2-SPEED AXLES

gives you greater speed, endurance, and economy!

This is HOW TDA's 2-Speed principle works! A husky hypoid ring gear and a bigger, stronger pinion set (No. 1 in illustration above) provide the *first step* of the total gear reduction for both fast and slow ratios. Two large, heavy-duty helical gear sets provide the *second step*. Both sets are of balanced size and capacity. One set (No. 2 in illustration) is for fast speed; the other (No. 3) is for slow speed. The clutch collar (No. 4) moves to right or left to engage one helical pinion or the other.

WHY this principle offers far wider spread! Because the TDA design is so simple, the ratio may be changed merely by changing the low speed helical gear pinion. Unlike ordinary designs which are limited to 37%, TDA offers spreads of 28%, 37%, and 49%. In effect, this flexibility gives you your choice of power ratios to exactly match your needs.

Greater endurance, longer truck life with TDA. TDA's simple design eliminates small complicated parts and midget size gears. Large hypoid helical design gives more teeth in contact – quieter operation and far less strain. Bearings are larger, too. Helical "Bull Gears" not in use idle, further reducing wear. All this adds up to longer engine life... and more efficient and profitable operation under all conditions.

THE FIRST 2-SPEED AXLE

gives TDA world's widest

TIMKEN Detroit AXLES

TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
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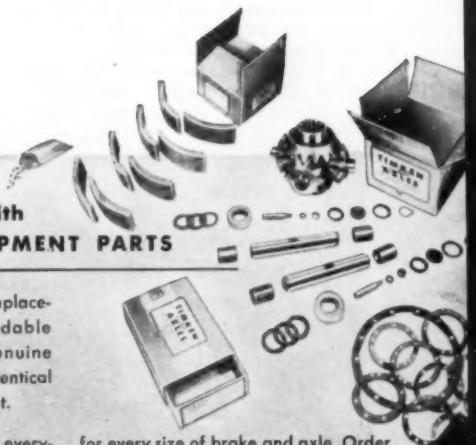
Plants at: Detroit, Michigan • Oshkosh, Wisconsin • Utica, New York • Ashtabula, Kenton and Newark, Ohio New Castle, Pennsylvania

. . . for more details circle 239, page 16



Increase axle life with GENUINE TDA EQUIPMENT PARTS

Take no chances with ordinary replacement parts. For sure, dependable factory-type jobs, specify genuine Timken-Detroit axle parts kits—identical to your axles' original equipment.

Each kit is complete — gives you everything you need in one handy package. Gaskets and shim parts, brake liners, steering knuckles, differential gears — for every size of brake and axle. Order by number from your dealer. Cut labor and adjustment costs. Get trucks back on the road quicker.

What's New
in Equipment and Materials

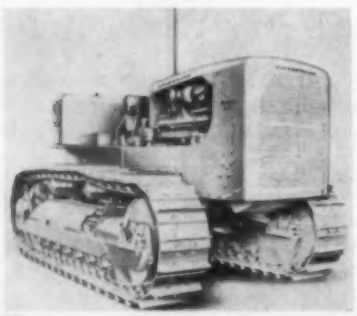
Reader Service Coupon on Page 16, more items pages 176-180

● One of the first experimental D9Xs was sent to the Marquette Cement Co., Oglesby, Ill., where it operated as a pusher and loading 90 scraper stripping overburden.

New Tractor Has 230-Drawbar Horsepower and Weighs 56,000 Lbs.

A 230-drawbar horsepower crawler tractor with turbocharged engine became the sixth machine in the track-type line of Caterpillar Tractor Co., Peoria 8, Ill., on May 1. It is the Cat D9 tractor which already has received considerable attention from construction men, loggers, mining men, and pipeliners during an extensive field testing program in 1954. Announcement of the 56,000-lb. D9 climaxes ten years of big tractor research and development at Caterpillar.

A new 6¾ x 8, six-cylinder Cat diesel engine is equipped with a turbocharger, an advancement in track-type tractor manufacture. The tractor also will have Caterpillar's oil-type clutch or optionally a torque converter, in-seat starting, hydraulic track adjustment, excellent operator visibility and many servicing conveniences.



● The Cat D9, a 230-drawbar horsepower turbocharge tractor.

Although the tractor is big, general appearance will conform to the other five models of Cat crawlers. Length is 17 ft. 10 in.; width, 9 ft. 11 in.; height (excluding exhaust pipe and air cleaner), 8 ft. 9 in. Ground clearance is 21 in.

Ninety-inch gauge will be standard as will a seven-roller track frame and fixed drawbar. A console-type control panel, seat design and location and careful arrangement of operating controls make a flat, relatively open deck.

There is a six-volt electric starter for the two-cylinder starting engine. The diesel engine, which delivers 286 HP at 1200 RPM for both the torque converter and direct drive models, shows considerable attention to external appearance. Oil lines, fuel lines and water tubes are placed internally as much as possible.

Several features of the engine include (1) short valve push rods which are possible because the camshaft is high in the block, (2) stationary oil jets provide a continuous stream of oil to cool the pistons, the camshaft and followers, (3) steel-back aluminum .bearings with the lower half of the center main bearing to take the camshaft thrust on a flange-type bearing.

All accessories are driven from a gear at the rear of the crankshaft to avoid much torsional vibration. There is constant power drive for rear-mounted equipment, such as cable controls, providing power regardless of whether the flywheel clutch is engaged or when the torque converter is operating at lowest speeds.

Pressure lubrication and full flow filtration are provided in the engine, the transmission, steering clutch release booster and each final drive. Pressure lubrication is provided also for the oil clutch and starting engine.

The torque converter is a three-stage, 5:1 torque multiplication unit using diesel fuel for the hydraulic fluid. The flywheel clutch used with the torque converter is a 19-in. single plate, dry-type. Torque converter fluid cooling is provided by a water-type heat exchanger mounted on the right hand side of the engine. Speeds up to 7.8 MPH with three speeds forward and two in reverse are provided. The direct drive has six speeds forward and six in reverse ranging from 1.6 to 6.8 MPH. With the direct drive transmission, drawbar pounds pull of 60,860 lb. are possible with adequate weight and traction.

Welded fabrication of the steering clutch case and main frame provides a rugged backbone for the entire tractor assembly which fits in with the severe service to which this machine will be subjected. A one-piece welded track roller frame includes closed oil-type recoil spring housing and track guiding guards at each end of the frame. The equalizer bar rests on moulded rubber pads on the track roller frame. Heavy-duty radiator guard and half-inch thick fenders are standard equipment.

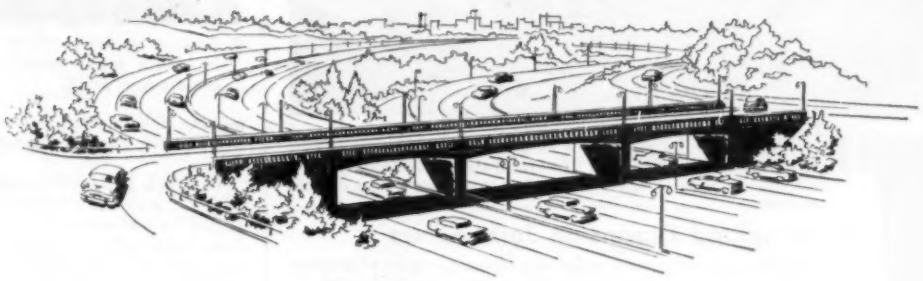
The conventional drive D9 will weigh 56,200 lb. and the torque converter model, 56,650 lb. The seven-roller track frame insures great flotation and stability. The front idler is the fabricated disc type. It is a two-position idler and may be adjusted for either dozer or drawbar work.

The standard track shoe, heat treated for wear resistence and strength, is 24 in. wide and there are 43 shoes to each track. There will be 129¾ in. of track on the ground making a total ground contact of 6,288 sq. in. Weight per drawbar horsepower is 235 lb. Twenty-seven and 30-in. shoes are available as optional equipment.

Many features of the D9 were designed with operator comfort in mind. Starting engine controls are readily accessible from the seat. The one-man seat has sponge rubber cushions and is adjustable fore, aft, and vertical. Oil clutch, steering clutches and brakes are power assisted for ease of operation.

Safety was considered throughout. There are locks on both brake pedals. Pumps are mounted on the rear of the engine to provide constant power for hydraulic actuation of brake and clutch boosters. Grab irons are mounted on the rear and sides of the fuel tank for board-

Whatever the size of an expanded highway program



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NATIONAL HEADQUARTERS, MUNSEY BUILDING, WASHINGTON 4, D.C.

The Contract Method of Construction Safeguards Public Funds

. . . for more details circle 161, page 16

● Engineer working with the wood mock-up which aided development of the console-type panel.

ing the tractor and another is on the left radiator guard for servicing the air cleaner.

The deck has been cleared of all but the most essential controls and those are placed for maximum efficiency. The bulldozer cable tube for the rear cable control unit is incorporated in the right hand main frame member for safety and appearance.

Many service conveniences have been built into the D9. The hydraulic track adjuster requires only a grease gun to operate. The steering clutch and brake drum assemblies can be removed separately without disturbing the bevel gear. The flywheel clutch assembly or the torque converter unit can be removed without disturbing the engine or the transmission.

The transmission barrel assembly can be removed without disturbing the flywheel clutch. Brakes and steering clutches can be adjusted through easily removed top covers in the steering clutch housing. Brake band assemblies can be replaced without removing the fuel tank assembly. Removal of the engine from the tractor can be accomplished without disconnecting the gauge lines and starting engine controls, since the gauge panel is mounted on the engine.

For more information circle 107 on Service Coupon Page 16 and mail now.

13 New International Truck Models

Thirteen new International six-wheel motor truck models, the heavy-duty RF-178, RF-200, COF-190 and COF-200 series, with gross vehicle weight ratings from 33,000 to 41,000 lb. have been introduced by the Motor Truck Division of International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. The series includes trucks of both conventional and cab-over-engine design. They bring to 92 the number of tandem drive units offered by Harvester.

In addition to the model RF-178, rated at 33,000 lb. GVW, the new trucks include four RF-200 series trucks ranging from 37,000 to 41,000 lb. GVW, four cab-over-engine COF-190 models from 30,000 to 35,000 GVW, and four COF-200 series six-wheelers with GVW ratings from 37,000 to 41,000 lb. The

RF-200, COF-190 and COF-200 series each include a Roadliner tractor model with gross combination weight ratings of 65,000, 55,000 and 65,000 lb., respectively.

Each of the new models incorporates International's performance-proved bogie design and precision-matched components for smooth and economical performance. Model RF-178 features a new 7,000 lb. front axle and 28,000 lb. rear bogie. Power is provided by the International Black Diamond 308 engine, which develops 145 HP. Wheelbases are 142, 154, 172 and 190 in. The International Red Diamond 406 engine, rated at 175 HP, is standard for RF-200 series six-wheelers. The Royal Red Diamond 501 is provided as optional equipment for highway application.

Equipment includes a 9,000 lb. front axle and 34,000 lb. rear bogie. Wheelbases of 145, 157, 175, 193 and 211 in. are available. Popularity of the short overall length, better load distribution and easier maneuverability, characteristics of International's cab-over-engine series, prompted introduction of the eight new six-wheelers of COE design. Standard powerplant for all models is the 175 HP International Red Diamond 406 engine. Wheelbases are 129, 147, and 165 in.

For more information circle 108 on Service Coupon Page 16 and mail now.

Small Engine-Driven Electric Plants

A complete new line of small engine-driven electric generating plants, entirely Onan built, ranging in size from 500 to 2500 watts has been announced by D. W. Onan & Sons, Inc., University Ave., S. E. at 25th, Minneapolis 14, Minn. The new models are available in

New Onan Engine-Driven Electric Plant

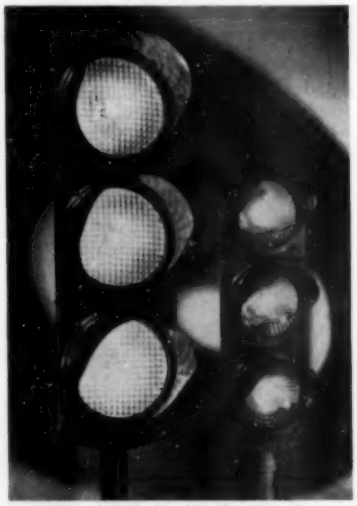
sizes of 500 and 750 watts, 60-cycle, A. C., for the AK Series and in 1,000 and 2,500 watts, 60-cycle, A. C. in the AJ Series. Battery charging units are available in sizes ranging from 500 to 1500 watts D. C. Powered by an Onan air-cooled, 4-cycle, single-cylinder gasoline engine, the AK models deliver 1.85 HP at 1800 RPM; the AJ models, 2.75 HP at 1800 RPM and 5 HP at 3600 RPM. The one-cylinder AK engine has a 2¾ in. bore and 2¾ in. stroke. Rated at 1.85 HP (at 1800 RPM) it is the prime mover for the 500-watt and 750-watt Onan-built generator. The AJ engine,

with a 2¾ in. bore and 2⅝ in. stroke, is rated at 2.75 HP at 1800 RPM, and powers the 1,000-watt Onan generator. The AJ, however, will deliver 5.0 HP at 3600 RPM for the 2500-watt models. The self-excited, revolving armature type generators are entirely Onan designed and built. They are inherently regulated. Frequency regulation is 3 cycles maximum.

For more information circle 109 on Service Coupon Page 16 and mail now.

Oversize Traffic Signal

A new, large size traffic signal, introduced by Crouse-Hinds Co., Wolf and 7th North Sts., Syracuse, N.Y., is stated to be 50% larger and almost four times brighter than present urban signals. It can be seen more than a mile away under normal visability conditions. Construction of the cast aluminum signals is unitized so that either three 12 in. sections (type H) or one 12 in. and two 8 in. sections (type K) may be stacked together. Type H signal weighs 43 lb., type K, 32 lb. Other features include a dust-tight optical system, lenses that meet ITE specifications, and mountings similar to those of the Crouse-Hinds 8 in. type T signal. Walk, Wait, arrow lenses, or neon arrows can be interchanged with conventional lenses. Any intersection presently signalized can be modified to use the new "jumbo" signal by removing the standard red light section, equipped with an 8-in. lense and 67-watt lamp, and replacing it with the larger signal section, which has a 12-in. lens and accommodates lamps of wattages up to 250.



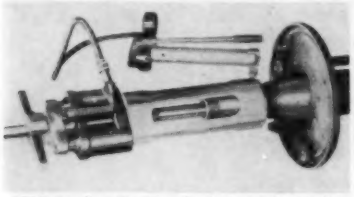
New Oversize Traffic Signal

For more information circle 110 on Service Coupon Page 16 and mail now.

Truck Axle Tube Puller

A new 50-ton hydraulic puller to remove or install truck axle tubes and sleeves has been announced by Owatonna Tool Co., 435 No. Cedar St., Owatonna, Minn. Because of the simple positive assembly of the OTC center hole ram and adaptors this new tool is stated to do this tough and time-consuming job with ease in less than half the time.

Should the axle tube be broken, an adaptor may be welded to the end of the tube which is then pulled without disassembling the differential. New tubes may be installed with the unit without damage or distortion. The versatile 50-ton OTC hydraulic unit is interchangeable with other OTC pullers and adaptors and may be used as a portable power unit in the field or in the shop.



OTC Hydraulic Truck Axle Tube Puller

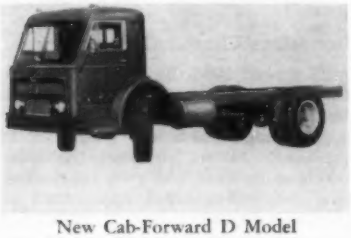
For more information circle 111 on Service Coupon Page 16 and mail now.

Cab-Forward Trucks

Mack Trucks, Inc. has started production of a radically new cab-over-engine truck series, said to be the most compact in the industry, and with a cab that power lifts vertically from the chassis for easy servicing. Designated as the Verti-Lift D series, these new cab-forward Macks are built in truck sizes from 20,000 to 28,000 lb. gross vehicle weight and as tractors in the 40,000 to 53,000 lb. gross combination weight range. The new units are available in four or six-wheel models and in a wide variety of optional platform lengths.

The most outstanding feature of the D series is the revolutionary Verti-Lift cab providing maximum engine accessibility. The new cab is the shortest from front to back in its class, permitting greater body length along with excellent driver comfort.

The standard engine in the D-20 models is the 290 cu. in. Mack Magnadyne gasoline unit developing 107 brake h.p. at 2800 r.p.m. The D-42 models feature a 150 h.p. Mack Magnadyne of 401 cu. in. displacement. Both models are offered with a wide selection of optional components, including five-speed and ten-speed Mack built transmissions, single and dual reduction axles and hydraulic or air activated brakes. Six-wheel models are equipped with Mack's balanced bogie with the exclusive power divider.



New Cab-Forward D Model

For more information circle 112 on Service Coupon Page 16 and mail now.

Stainless Steel Trowels

A new line of trowels manufactured from a new and patented flexible stainless steel alloy is being offered for the first time by Goldblatt Tool Co., Dept. Y

23, 1760 Walnut St., Kansas City 8, Mo. Trowels of this stainless steel have several advantages over the usual kind of steel trowels, according to Goldblatt. The nature of this special analysis stainless spring steel makes the trowels more resistant to rust, abrasion, staining, pitting and wear in general, the manufacturer says. Goldblatt is offering the trowels in two sizes: a 14 in. x 4 in. cement trowel ($5.95 each) with straight handle, and a 10½ in. x 4½ in. plastering trowel ($5.75 each) with either straight handle or camel back handle.

Plastering and Cement Trowels

For more information circle 113 on Service Coupon Page 16 and mail now.

New HD-16 Diesel Crawler Tractor

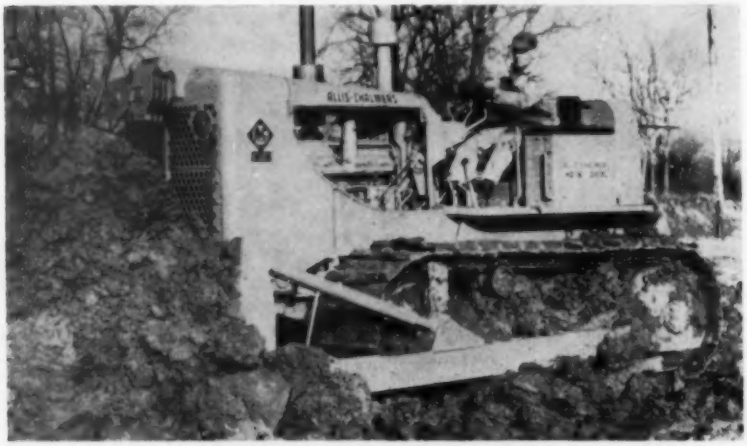
Its second completely new crawler tractor this year, the 31,500 lb., 1 & D-16, available with torque converter drive and standard transmission, has been announced by Allis-Chalmers Manufacturing Co., Milwaukee 1, Wis. This model follows the 44,000 lb. HD-21 tractor and the TS-360 motor scraper announced in February.

The HD-16 has the new Allis-Chalmers 6-cylinder, 844 cu. in. diesel engine which develops 150 net engine h.p. at 1800 rpm with torque converter and 140 net engine h.p. at 1600 rpm with standard transmission. Maximum drawbar pull of 60,000 lb. is obtained with torque converter drive. The standard transmission tractor has a maximum drawbar pull of 31,700 lb. at rated engine speed. Under over-load, the engine torque increases, thus resulting in additional drawbar pulls up to 35,945 lb. at reduced travel speeds.

Included in the basic design of the HD-16 are such features as all-steel box-type "A" main frame which makes possible unit construction for easy service accessibility; one-piece, line-bored steering clutches and final drive housing for long gear life; straddle-mounted double-reduction final drive gears mounted on tapered roller bearings to eliminate gear spreading and corner loading of gears; and roller bearing truck wheels with 1000-hour lubrication to save maintenance time.

New features of the HD-16 include "Wrap-Around" radiator guard which tilts forward and down for easy accessibility; Allis-Chalmers diesel engine and matched torque converter power team; extra long-life ceramic master clutch lining; newly-engineered power train with correct gearing for developing the high drawbar pulls plus big reserve capacity to provide maximum productive hours on the job.

For more information circle 114 on Service Coupon Page 16 and mail now.



New HD-16 Allis-Chalmers Crawler Tractor

Huber-Warco Model 5D-190 Motor Grader

195 HP Motor Grader

First new product of Huber-Warco Co., Marion, O., is the 5D-190, stated to be the world's first motor grader to offer a power of 195 HP. Power for this unit is supplied by a General Motors 6-71 diesel engine, through a torque converter and full power shift transmission. This power train is stated to eliminate the need for a clutch; reduces shock loading, thus giving extended life to the unit, and less down time for maintenance.

The tail shaft governor, automatically adjusts the engine rpm to meet any load conditions, at any ground speed set by the operator. Ground speed of the 5D-190 ranges from .85 to 20 mph. An Allison Torqmatic transmission permits power shifts to be accomplished while the grader is under full load, eliminating any reduction of speed or loss of power.

Completely cab-controlled blade movement on the 5D-190 is stated to make it possible for the operator to shift the blade from 90° on one side to 90° on the other in less than a minute. This operation is performed hydraulically, with no linkages to adjust manually.

A high-arched front axle gives a front-end clearance of 32 in. A 13 ft. power sliding moldboard is standard equipment.

For more information circle 115 on Service Coupon Page 16 and mail now.

Boomless Chemical Sprayer

The new 1955 Broadjet of Hanson Chemical Equipment Co., 3001 Charles St., Beloit, Wis. has a new and exclusive nozzle design which lowers the crest of the spray 10 in., elongates the spray width up to 68 ft. and gives more effective and economical applications of chemicals. Broadjet has no boom nor pulleys or chains. It mounts on any tractor, truck or jeep in just a few minutes.

The Broadjet easily by-passes all roadside obstructions while applying broad effective swaths up to 36 ft. for roadsides, fence rows and ditch banks.

For more information circle 116 on Service Coupon Page 16 and mail now.

Machine for Triaxial Shear Testing of Soils

All controls necessary for both routine and special triaxial shear testing of soils are incorporated in the new compact K-W triaxial testing machine of Tinius Olsen Testing Machine Co., 5060 Eastern Road, Willow Grove, Pa. Actual field conditions can easily be simulated with this new table mounted unit as any desired lateral pressure up to 50 psi. can be applied and maintained to the sample with either air or glycerin. Precision needle valves make it easy to have complete control of all phases of the test. The K-W Triaxial is available in three models with varying load capacities of 100, 250, or 500 lb. The Model 500, which is normally used with a 500 lb. load capacity, is designed for a maximum 2,000 lb. capacity. It also has a variable speed drive of 0.2 in. per minute. All three models can be converted into unconfined compression testing machines just by removing the test chamber and making a few minor adjustments. The Model 520 can also be adapted for California Bearing Ratio penetration tests.

For more information circle 117 on Service Coupon Page 16 and mail now.

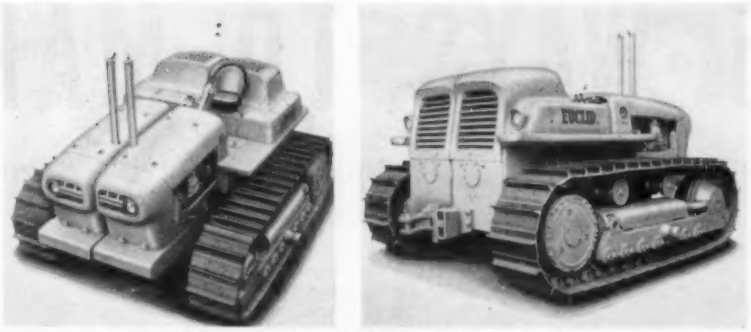
Compression Brake System For Heavy Trucks

Braking of heavy trucks by motor compression — the Williams compression brake system — has been recently developed by the Power Brake Equipment Co., 1632 SE 11th Ave., Portland, Ore. Basically, the unit converts the truck engine into a low pressure air compressor which slows down and holds back the vehicle. The Williams system can be installed in both gasoline and diesel powered trucks.

The key to the system, compression, is achieved by the installation of a special port between the carburetor and the intake manifold (in gasoline engines), and the placement of a butterfly valve between the manifold and the muffler, which restricts the escape of the exhaust from the manifold. Thus, on the first downward stroke of the piston (the inlet valve being open and the exhaust valve closed) pure air is drawn in through the port. On the return stroke, (both valves closed) the air is compressed. On the next downward stroke the air is decompressed (throttle at idle). On the next return stroke the exhaust valve is open, but the Williams butterfly valve restricts the exhaust's escape. Each succeeding exhaust stroke builds up pressure, and a braking influence is achieved almost equal to the horsepower output of the engine.

The operation of the Williams compression brake system is controlled by the driver of the rig with a convenient hand valve on the steering post, together with a gauge showing manifold pressure. The amount of brake pressure is controlled by hand; the pressure is instantly released with the foot throttle.

For more information circle 118 on Service Coupon Page 16 and mail now.



Two views of the new Euclid TC-12 Twin-Power Crawler Tractor

Euclid TC-12 Twin-Power Crawler Tractor Now in Production

Euclid Division of General Motors Corporation, Cleveland 17, O., is now in limited production on its TC-12 twin-power crawler tractor. The TC-12 incorporates many new operating and maintenance features that are exclusive with Euclid. Its outstanding feature is the use of two 194 hp Series 6-71 General Motors diesels, each driving one of the tracks through separate Allison Torqmatic drives consisting of torque converter and semi-automatic transmission. There is no master clutch. Changing from one speed range to another is done under full power. Three speed ranges, forward and reverse, provide speeds to 1.5 mph in low range, 3.0 mph in intermediate, and 8.3 mph in high.

This arrangement of the power train provides simple operation, a smooth steady flow of power and greater drawbar pull at faster speed. With a separate power train for each track, steering is faster and easier. Steering is accomplished by putting either transmission in neutral and using the corresponding steering brake. Tight turns are made by reversing one transmission and keeping the other in forward speed. The operator has "hair trigger" control of steering in any speed range, forward or reverse.

Maintaining proper track tension is automatic on the TC-12. A hydraulic jack maintains uniform pressure on the front idler and an accumulator absorbs recoil if a large stone or other object should get between the track and sprocket.

The twin-power design results in each half of the tractor being a separate unit joined to the other by a single big transverse shaft. Each half is thus free to move 7 in. up or down to maintain better contact and traction on rough ground. For shipping purposes, the tractor can be separated into halves.

Track and carrier rollers, 7 on each side, have 1000 hour lubrication. Barrel type bearings have wide spacing and self-adjusting face type seals. Heat treated shaft and rollers are integral units for longer life and lower maintenance. There are 39 shoes on each track. Ground contact with 26-in. track shoes is 6000 sq. in.

Another design feature is the rear location of the two radiators, each having 28 gal. capacity. There is no obstruction of air flow regardless of attachments — efficient engine operating temperatures can be maintained. Hinged radiator hoods make replacement of a fan belt or other servicing a simple matter.

Final drive is the same planetary design that has been used in other Euclid earthmoving equipment for many years. Planetary gears can be easily serviced without removing track assembly, frame or drive sprocket. No special tools are required for removal of the drive sprocket.

Track gauge is 110 in., over-all width is 136 in. and over-all length is 194 in. Drawbar height is 23 in. and ground clearance is 20 in. Operating weight of the bare tractor is 58,000 lb. Drawbar pull of the tractor, with normal bulldozer attachments, is 69,750 lb. dependent on total tractor and equipment weight.

For more information circle 119 on Service Coupon Page 16 and mail now.

Powerized Gooseneck Trailer

A new "powerized" gooseneck trailer which can be loaded or unloaded by one man, without skids, has been announced by LaCrosse Trailer Corporation, LaCrosse, Wis. Designed especially for moving heavy loads in congested areas, or where low overhead clearance is a problem, the new trailer combines low carrying height with an ingenius arrangement which permits disconnecting the gooseneck automatically from the rest of the trailer, for loading or unloading over the front end. The gooseneck also contains a powerful double-acting hydraulic unit, which raises and lowers the trailer platform for fast, safe handling of loads. It can also be used to raise the rear wheels of the tractor for changing tires, or to lower the trailer bed to "stoop" unled low wires or underpasses.

5 WAYS TO MAKE MORE

From The Multi-Billion Dollar Highway

HIGH SPEEDS IN OREGON—This Athey PR21 Trailer-Cat DW21 Tractor is working on rock-fill on an Oregon highway project. The PR21 takes on a 31-ton load of rock, hauls at speeds up to 26.6 MPH, dumps in an average of 20 seconds!

60% TO 80% SAVINGS—That's what the Athey Portable Breaker with Force-Feeder Loader does on road surfacing reclamation projects. Working with a Cat Motor Grader, this Athey Portable Breaker helps rebuild roads in the State of Washington.

DUMP ON-THE-RUN!—Near Oglesby, Illinois, this 22 cu. yd. Athey PD20 Trailer, and Cat DW20, dumps with the tractor moving along in third gear. There are no stops, no turns, no shifting—just steady, profitable production as the PD20 dumps on-the-go!

MONEY...

Program

As America's greatest highway building program gets into action, you can put yourself in the picture for bigger profits.

Take a look at these teammates. Match your work with time-tested, profit-proven Athey and Caterpillar machines! You'll gain the dependability and lower costs that spell more profit.

They're backed by the combined engineering talent of the leaders in material transportation and loading — Athey and Caterpillar.

Experience of more than 82 years, is behind Athey and Cat equipment.

TIE-IN WITH TOP FEATURES

Look at the design features—features that give you more yards moved every hour . . . features that mean more operating hours per machine . . . features that assure top profits per job!

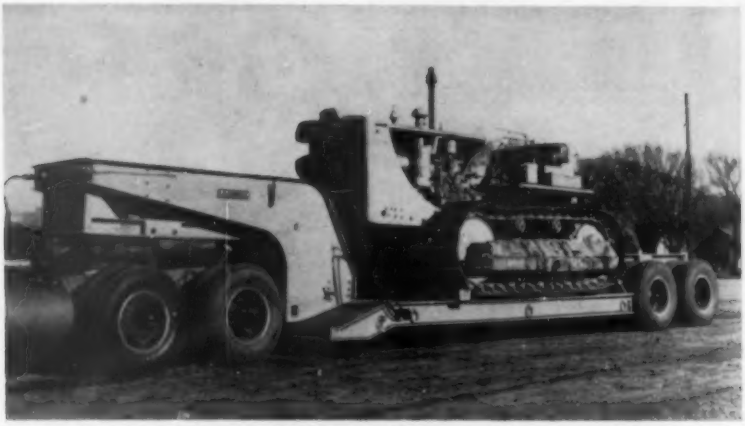
The highway jobs are here! The machines are available. Get in on your share of the big projects ahead! Call your Athey-Caterpillar dealer and ask for a free job analysis that can help you earn *more* money. Or you can write us for this free information—do it *now!*

ATHEY PRODUCTS CORPORATION
5631 West 65th Street
Chicago 38, Illinois

. . . for more details circle 166, page 16

STOCKPILE LOADING AT 3000 TONS PER DAY! The Athey HiLoader puts mass production into stockpile loading—handling as much as 8 to 10 cu. yds. each minute. This HiLoader is loading 5 tons of crushed slag per minute at Charleston, S. C.

FAST, BIG CAPACITY WINDROW LOADING! The Athey 7-11 Force-Feed Loader is a teammate of Cat Diesel Motor Graders. It picks up windrowed materials—up to 8-10 cu. yds. a minute. Oil mix and other surfacing materials can be handled by this many-purpose road-building tool. This 7-11 Loader is working in Indiana.



New Powerized Gooseneck Trailer in Travel Positions with Platform Raised and Firmly Connected to Gooseneck

Main advantage of the new LaCrosse unit, according to the manufacturer, is that the only mechanical connection between gooseneck and trailer is a standard inverted fifth wheel in the base of the gooseneck, which attaches to a standard spring loaded king pin on the front of the trailer platform. This provides a proven dependable hook-up, which is easy to line up and virtually automatic in operation. It also makes the gooseneck a firm controlled-part of the tractor and provides a flexible means of power source, either self-contained gas or electric, or through power take-off from the tractor.

Current LaCrosse "powerized" gooseneck model LXC-33D is 33-ton capacity, spring-mounted, with 10:00x20 14-ply tires and a 16 ft. x 8 ft. loading surface, which can be increased to 10 ft. width by means of extension brackets. Flat areas at either end are available for other loads. The company has announced that they expect to produce additional models in the near future.

For more information circle 120 on Service Coupon Page 16 and mail now.

Dual-Axle Drive Unit

A new dual-axle drive unit has been put in the market by Truckstell Mfg. Co., Union Commerce Bldg., Cleveland 15, O. The new unit, engineered for tandem axle six-wheelers, is a combination of Truckstell's three-speed power divider and a new suspension which has been under test for the past three years. Features claimed for the new suspension include: First, it requires no lubrication — ever. Second, operational costs are minimized by constant alignment of driving axles for longer U-joint and tire life. Automatic tire tracking is accomplished by specially-designed spring housing beams, steering torque rods and rubber bushed radius rods which align all driving wheels on the straightaway, and guide and control them on curves and contours. Third feature of the new unit is a brand-new idea for spring arrangement. Spring leaves in the unit are encased in a closed spring housing box and carried in upper and lower stages.

For more information circle 121 on Service Coupon Page 16 and mail now.

12 Cu. Yd. Tower Excavator

This tower machine is believed to be the largest single excavating unit ever made for sand and gravel operations. The machine handles 450 cu. yd. per hour on an average haul of 300 ft. for a West Coast supplier. Its maximum length of span is over 600 ft. The Crescent scraper bucket delivers 12 cu. yd. of material to the hopper on each trip. It works between a 90 ft. head tower which moves on rails at the floor of the pit and a 50 ft. tail tower traveling the top of the 240 ft. high bank. For more information write to Sauerman Bros., Inc., 522 S. Clinton St., Dept. W-12, Chicago 7, Ill.

For more information circle 122 on Service Coupon Page 16 and mail now.

Protection from Respiratory Hazards in Road Building

Respiratory hazards in the road building trades have long been recognized under certain and variable conditions and dangers to the workman's health.

Today a great deal has been done for leading industries in the matter of respiratory protection which is of direct benefit to the construction industry.

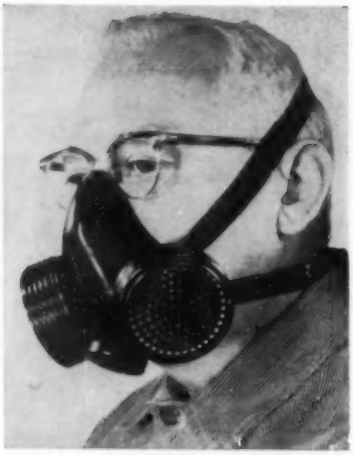
Continuous progress has been made in the design and manufacture of respirators and masks that give effective protection against each of the prevailing types of road construction and material hazards. Special respirators also have been developed to meet the new hazards associated with dusts.

The attitude of the worker must always be kept foremost in mind, since the average laboring man thinks first of his comfort and doesn't want to be "bothered" with safety devices. He doesn't realize that most such hazards were unknown and probably unborn in his grandfather's day.

Meeting the challenge for comfortable as well as effective general-purpose respirators, equipment designers, recently have made available for industrial use an "interchangeable" model. A respirator of this type gives comprehensive protection against non-emergency breathing hazards through a functionally integrated "interchangeable" series of filters and cartridges.

This type of respirator makes possible the use of one basic face-piece assembly, accompanied by a selected variety of filters or cartridges, to insure effective protection and comfortable fitting for

12 Cu. Yd. Tower Excavator on Sand and Gravel Operation



Interchangeable Model of Respirator

all types of faces against a wide range of respiratory hazards. By a simple exchange of cartridges or filters, these respirators may be changed quickly and easily to cope with any commonly met type of exposure. Special filters even provide protection against trace quantities of dusts. This elimination of extra parts provides impressive stockroom savings in large organizations.

For more information circle 123 on Service Coupon Page 16 and mail now.

General Purpose Dump Body

A new general purpose dump body, of 2 cu. yd. capacity and designed for mounting on 1-ton pickup trucks, has been announced by The Galion Allsteel Body Co., Galion, O.

Galion Allsteel Model 2NP fixed-side Handi-man Dump Body With Galion All-Steel Model 334N Hoist

Known as the Handi-man, the new body is available in both fixed and removable side types. The fixed-side Handi-man, designated Model 2NP, is constructed of 10 gauge high-resistance steel throughout. Understructure consists of 3 in. channel crossmembers and 3 in. channel longitudinals. Model 6NP Handi-man features similar construction plus the added advantage of fully removable sides and rear corner posts. Both models, offered in lengths of 7½ and 8 ft., are 78 in. wide inside. Side height is 12¾ in. and head and tailgate are 6 in. higher than sides. The sturdy doubleacting tailgate, fitted with fabricated hardware and up-hook type lower latches, is controlled by a conventional lever mounted at the left corner of the body.

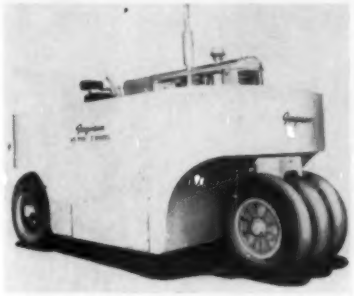
Handi-man bodies are suitable for mounting with Galion Allsteel Model 334N hoists of 4-ton capacity, on trucks with a cab-to-axle distance of 60 in.

Galion Model 600 Fulcrumatic hoist of 6-ton capacity can also be used.

For more information circle 124 on Service Coupon Page 16 and mail now.

25-Ton Rubber Tired Rollers

Two new self propelled rubber-tired rollers, the Model 257, with 7 wheels and Model 2511, with 11 wheels, each weighing 25 tons when fully ballasted with sand, have been placed on the market by Shovel Supply Co., 4900 Hines Blvd., Dallas, Tex. Both rollers are equipped with Minneapolis-Moline 62HP gasoline or diesel engines and special transmissions, providing six speeds forward and six reverse, operating equally well in either direction, thereby eliminating the necessity of turning. Large diameter tires, for light draft and high rolling speed, are arranged to conform to U.S. Corps of Engineers' specifications. Pressures up to 795 lb. per inch of tire width may be obtained. Hydraulic steering mechanism provides easy maneuverability.



Model 257 Roller

For more information circle 125 on Service Coupon Page 16 and mail now.

Electric Shovel Has Many Innovations

Details have been released by Harnischfeger Corporation on its newest and largest electric shovel. Designated the P&H Model 1800, this heavy-duty mining shovel has an 8 cu. yd. capacity, and introduces many innovations in large shovel design. The first P&H Model 1800, equipped with a 9-yd. dipper, will join forces with four other P&H electric shovels at Bagdad Copper Corporation, Bagdad, Ariz.

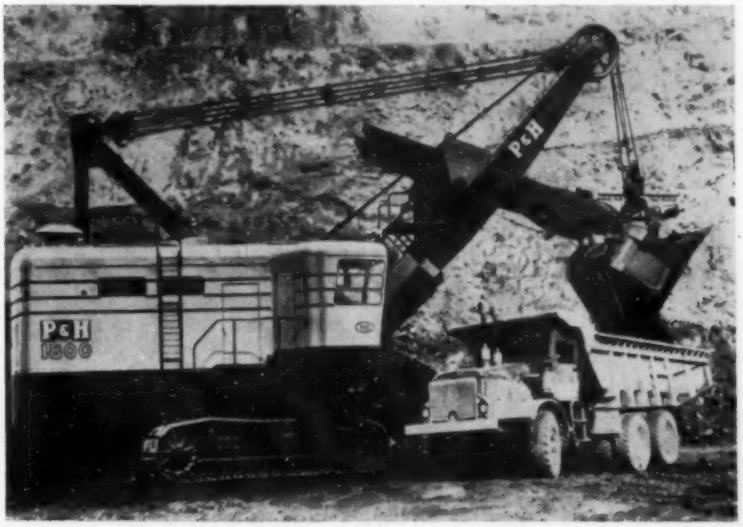
The Model 1800 innovations include P&H electronic control for all operating functions, centralized A. C. motor drive, widespread boom foot with rubber shock absorbers and externally mounted propel brake. The 1800 also features Magnetorque hoist drive. Hoist power is transmitted electro-magnetically, without friction, without wear, resulting in smoother, faster operation. The P&H Model 1800 has a boom length of 39 ft. with 24-ft. dipper sticks. The machine stands 40 ft. high and weighs 525,000 lb.

Details on the new machine may be obtained from the Harnischfeger Corporation, Electric Shovel Division, 4617 W. National Ave., Milwaukee 46, Wis.

For more information circle 126 on Service Coupon Page 16 and mail now.

Portable Traffic Signal

A portable traffic signal that has many uses for emergency control of traffic is now being manufactured by Portable Traffic Signals, Inc., 146 W. 21st St., Los Angeles 7, Calif. Features of this 4-way, self contained, adjustable timing, battery operated traffic signal include Base: Constructed entirely of heavy 16 gauge sheet steel and equipped with two 8-in. diameter, ball-bearing wheels with solid rubber air cushion tires, 600-lb. test. Height: 7 ft. to bottom of green lens. 9 ft. 4 in. overall height. Additional height available upon request. Head Assembly: Constructed entirely of aluminum alloy. Lamp Assemblies: 12 reflectors of highly polished spun aluminum, alzak process. Equipped with 11 volt regular C-9 type traffic signal bulbs. Four each, red, amber, and green I.T.E. standard, 8¾ in. diameter prismatic diffusing lenses. Battery: Heavy duty,



P & H Model 1800 Electric Shovel

Traffic Sentry

marine type, long life battery. Self-concontained battery charger, 110-volt. 50-60 cycle.

For more information circle 127 on Service Coupon Page 16 and mail now.

Mower Attachment for Motor Grader

A fully hydraulic mower that can be attached to an Allis-Chalmers model "D" motor grader has been announced by the Triumph Machinery Co., Hackettstown, N. J. Known as the "Hydro-Clipper," the mower can be either attached or removed in a matter of minutes. Only 4 bolts are required and the mower is operated entirely by the hydraulic pump on the grader. The overall width of the "D," with mower in transport position, is only 95 in. while the height of the cutter bar, in raised position, is approximately 7 ft. The new unit incorporates the same "Hydro-Clipper" mower that has been successfully used with all makes of wheel tractors. All controls can be operated from the cab and the operator can instantaneously change from grading to mowing by moving a single control lever.

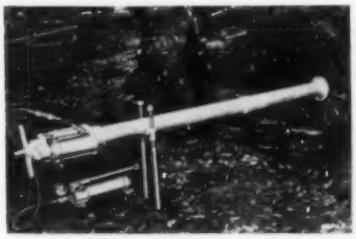
Hydro-Clipper Mower

For more information circle 128 on Service Coupon Page 16 and mail now.

New OTC Puller

Substantial savings in time and labor are claimed to be possible with this portable 100-ton power-twin hydraulic tool built especially to remove and install pivot or dead shafts on International industrial tractors T-6, TD-6, T-9, TD-9, T-14, TD-14 and TD-18. The 100-ton, remote control hydraulic unit provides

ample power for this difficult job. The set includes a complete range of adaptors to cover the above models and provides a means of bracing the tractor "A" frame to avoid distortion. With this tool one man can do the complete job in a fraction of the time formerly required. The power-twin hydraulic unit is an integral, portable unit interchangeable with other OTC pullers for removing and installing tractor drive sprockets, tractor pins and many other difficult jobs. For prices and complete details write Owatonna Tool Co., 435 No. Cedar St., Owatonna, Minn.



OTC Puller Y 3100-A

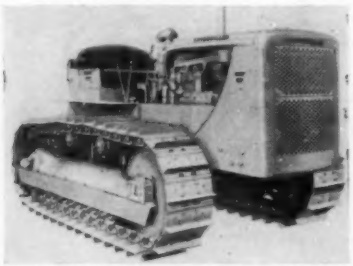
For more information circle 129 on Service Coupon Page 16 and mail now.

Tractor Has Many New Engineering Improvements

Increased horsepower and engine speed highlight many new engineering improvements in the new D7 track-type tractor announced by Caterpillar Tractor Co., Peoria, Ill. The engine has 128 HP at 1,200 rpm compared to the 108 HP at 1,000 rpm in the previous model. The maximum drawbar pull for the D7 is now 28,700 lb., approximately 3,500 lb. pull more than its predecessor.

Another important innovation designed to improve the new tractor's operation is an engine balancer which reduces vibration and permits the 4-cylinder engine to operate at 1,200 rpm with the same degree of smoothness as a 6-cylinder design.

Other new major engineering features which contribute to greater productive capacity in the new D7 include: redesigned engine block; new fuel injection system; a new starting engine; new radiator; large fuel tank; new fuel filter system; redesigned oil filter base adapter; and improved air cleaner.



New More Powerful Caterpillar D7 Tractor

For more information circle 130 on Service Coupon Page 16 and mail now.

For more ideas on Equipment and Materials . . . . see page 176

SURE!

the DUO-MIX (DOUBLE DRUM) MULTIFOOTE will give you 80 batches per hour

● If you are planning to use your single drum paver on those paving contracts coming up you are not going to be in as good a position for bidding competitively nor will your profits from the job be as high.

The MultiFoote DuoMix (Dual Drum) Paver has delivered over 80 batches an hour—almost twice that of the Single Drum 34-E.

The MultiFoote DuoMix brings you a combination of features found on no other Dual Drum concrete paver. Shovel type crawlers with self-cleaning action stand up under miles of travel. They are an unusual and outstanding feature on a big machine like this. You have a simple, *mechanical,* automatic mixing cycle—no air, no valves, no pumps to get out of order—and it's quickly shifted to manual control. The MuliFoote High Operating Platform gives a full view of both Bucket and Skip and good vision lets the operator clip seconds off the cycle. Simple design, anti-friction bearings, single line Skip Hoist free from extra sheaves and cable, plenty of water, fast, simple Rotary Discharge and Transfer combine to assure easier upkeep and high output.

Give consideration to replacing your single drum machines before spring work opens up—and if you are planning on new equipment let a MultiFoote Man tell you more about this record making paver.

● A MultiFoote DuoMix establishing the Pennsylvania Turnpike record of a mile of 9 in., 12 ft. lane in 13 hours on the eastern extension.

BLAW-KNOX COMPANY
CONSTRUCTION EQUIPMENT DIVISION
1936 State Street
Nunda, New York

BLAW-KNOX

MULTIFOOTE CONCRETE PAVERS • BLAW-KNOX AND ADNUN BLACKTOP PAVERS

. . . for more details circle 185, page 16

Bituminous ROADS AND STREETS

Placing cold mix for street surfacing at Perry, New York. Cipriano Gravel Co., of Mt. Morris, N.Y., contractor. Machine is an Adnun Jr. 8, used also for placing stone for base course.

Published by Gillette Publishing Company
22 West Maple Street, Chicago 10, Illinois

Minnesota Bituminous Program Reviewed
Crusher Run Gradation Corrected in Hot-Mix Plant
How County Salvages Old Road Surfaces
What's New in Construction Equipment and Materials

MAY 1955

Simplified Bitumuls Base Treatment Slashes Cost on Heavy Duty Haul Roads

West Coast Logging Firm Benefits from Use of Diluted Bitumuls®

One of the toughest jobs a road builder faces is maintaining haul or access roads for heavily loaded vehicles at a ton-mile cost compatible with available funds and within the scope of equipment on hand.

Costs Down 50%

One West Coast logging company now believes it has an answer to this difficult problem. Last year, they used what is known as the "Diluted Bitumuls Base Treatment." This has not only increased the serviceability of these roads, but has also actually cut their costs more than 50% below that of the previous best method used.

Previous Methods

Back in 1950 this company used an asphalt cut-back with 10% Diesel oil added, at a cost of $620.00 per mile. Cost prohibited the application of aggregate cover and considerable pickup and raveling under traffic resulted. Three months of penetration patching with Bitumuls emulsified asphalt was required to keep this road in operation. No costs were kept on this maintenance work.

In 1951 a heavier application of the cut-back Diesel mixture was used, at a cost of $650.00 per mile. A ¾ inch application of ⅛" crushed rock was placed at certain sections where pickup and raveling was severe. Patching was again required to maintain this road under the tough traffic conditions.

In 1952 the company tried using hot applied fuel oil and the same type of aggregate cover. This combination gave longer, trouble-free wear, but the cost was still higher (nearly $1,000 per mile).

Diluted Bitumuls Treatment

In both 1953 and 1954, a mixture of 10% Bitumuls SS-1 and 90% water was used at 1200 gallons per mile in three applications of 400 gallons each. *Total cost of this treatment was $294.00 per mile.* Observations after two years have indicated that the base established by this treatment required no aggregate cover and did not pick up or ravel under traffic. Dust, which formerly constituted a real hazard, was held to a minimum, and when it did occur was of a heavy and quick-settling type.

Many old timers will tell you that the Diluted Bitumuls Base Treatment is not new. It has been used in other parts of the country under various names, but the methods employed are much the same. All that is required is a water wagon, a mixing blade, (or motor patrol) and a roller. Material is windrowed; the diluted Bitumuls applied by sprinkler trucks and then mixed, spread and compacted. After compaction the road can be opened to traffic.

Full information on the Diluted Bitumuls Base Treatment and on other types of Bitumuls construction can be obtained by calling our nearest office.

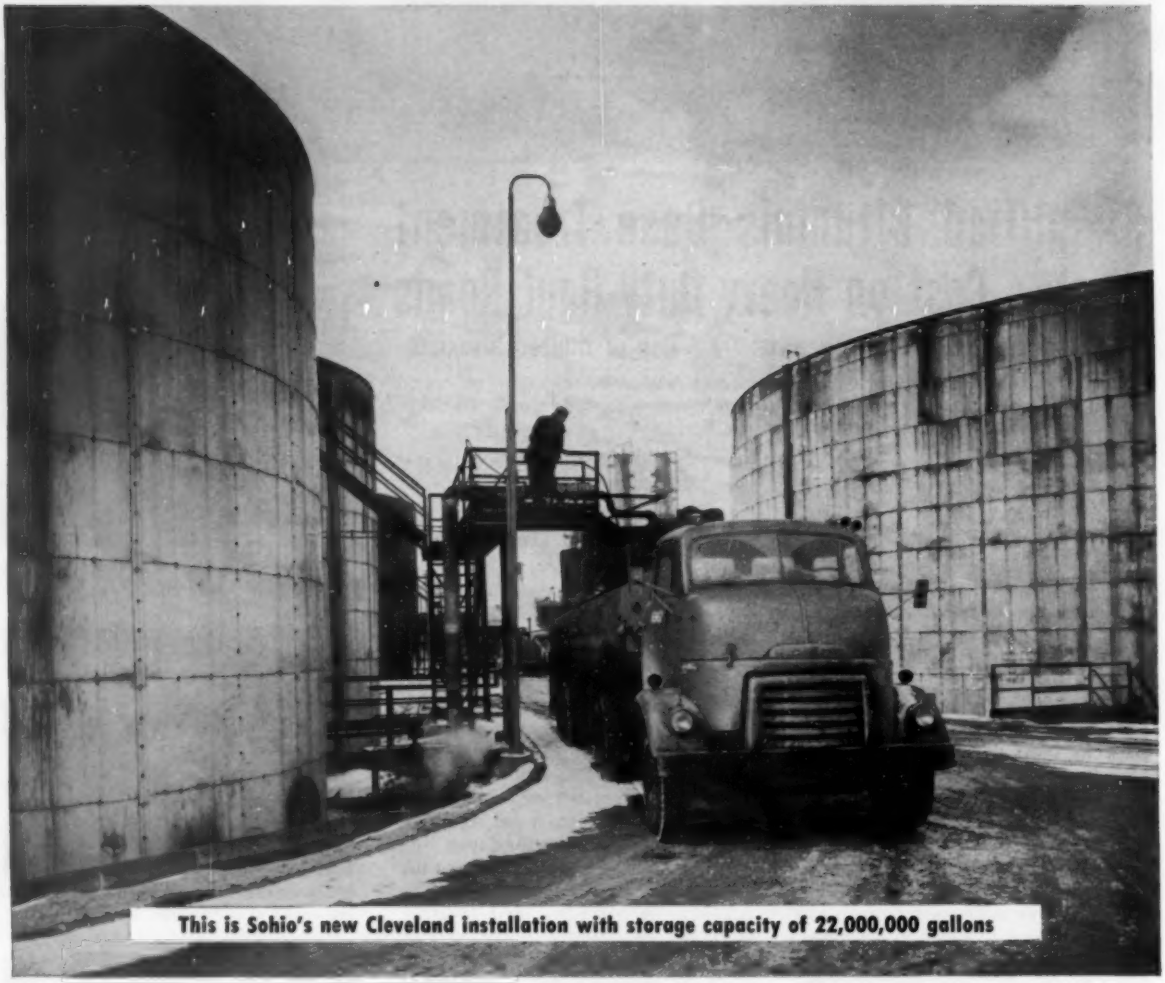
WATER-WAGONS like those shown here, a blade grader and a roller were the only pieces of equipment needed to maintain good, stable haulroads by the Diluted Bitumuls Base Treatment method.

WATER-WAGON applies Diluted Bitumuls to base material.

BLADE GRADER is used for mixing and spreading ahead of compaction.

THREE-WHEEL ROLLER compacts base to a smooth, dense finish.

2 GREAT NEW SOHIO ASPHALT TRUCK-LOADING FACILITIES *NOW IN OPERATION*



This is Sohio's new Cleveland installation with storage capacity of 22,000,000 gallons

Storage capacity in new Cleveland installation is world's largest! New facilities at Latonia are second only to Cleveland in this area!

To give users of asphalt better service than ever, Sohio has built two great new storage and truck-loading facilities—one at Cleveland—the other at Latonia.

The new Cleveland installation includes the largest finished asphalt storage capacity in the world—22,000,000 gallons! Its loading racks can accommodate 12 transport trucks at a time—up to 150 trucks per day.

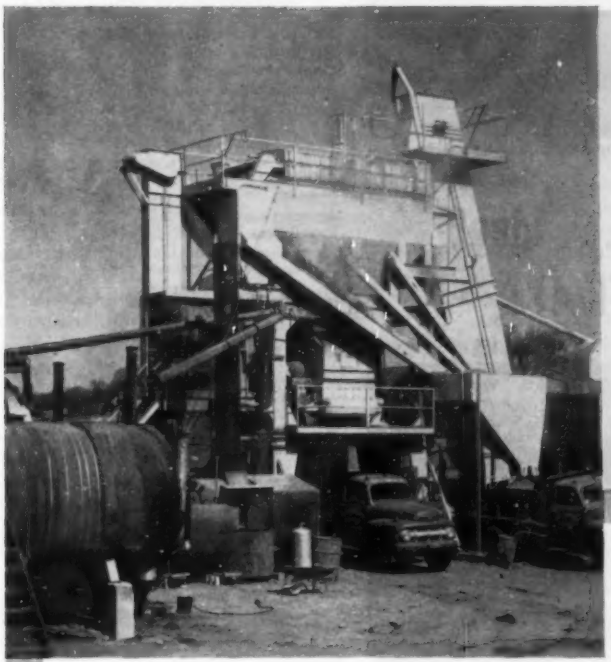
Sohio's new Latonia plant boasts 15,000,000 gallons of finished asphalt storage capacity—second only to Cleveland's in this area. Number of truck loads handled per day is often as high as 100.

With these two great new facilities, asphalt of uniformly high quality is quickly available day or night to contractors throughout the area served. They mean better-than-ever asphalt service . . . from Sohio.

SOHIO ASPHALT

. . . for more details circle 248, page 16

Don't CLOSE ONE EYE WHEN BUYING AN ASPHALT PLANT



• It's good business to keep **both** eyes open when you buy an asphalt plant . . . one eye on your immediate asphalt plant needs and one eye on your future requirements. You can be certain what your needs are today, but what about next year or five years from now? What will your requirements be then? Be on the safe side . . . buy a plant that will handle your needs both today and tomorrow — the MADSEN Model 481 ASPHALT PLANT! You can purchase this outstanding asphalt plant as a 4000-lb. plant, and at a later date you can convert it into a 5000-lb. or 6000-lb. plant with only minor modification costs. This MADSEN advantage provides you with the benefits of a lower investment today, and the opportunity of meeting your increased-production-needs at a very little increase in cost.

▲ *Here is the MADSEN Model 481 Asphalt Plant in operation for a mid-west contractor. Note the operator platform on the end of the plant away from fumes and dust...and the combination overflow and reject bin mounted on the side of the plant for easy accessibility.*

STAY MODERN WITH MADSEN...Buy the MADSEN Model 481—the asphalt plant that saves you money and makes you money today...and keeps saving you money as it keeps pace with your production needs. Ask your MADSEN Distributor about the many exclusive MADSEN advantages offered in the Model 481 and ask for your copy of Bulletin No. 800

MADSEN *Equipment that Serves* ®

MADSEN — HELPING TO BUILD THE HIGHWAYS OF THE WORLD — Since 1900

MADSEN
MODEL 481 ASPHALT PLANT

THE PLANT THAT LETS YOU INCREASE PRODUCTION CAPACITY 50% WITH ONLY MINOR MODIFICATION COSTS

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ASPHALT PLANTS and ASPHALT PLANT EQUIPMENT

BALDWIN BLH LIMA-HAMILTON

Construction Equipment Division

Manufactured by

MADSEN IRON WORKS, INC.

Subsidiary of Baldwin-Lima-Hamilton Corporation

14100 EAST ROSECRANS AVENUE, P. O. BOX 38

LA MIRADA, CALIF., U. S. A.

. . . for more details circle 219, page 16

Penetration Macadam (Specification No. 1) used for surfacing a business parking lot.

EMULSIFIED ASPHALT... ideal for surfacing *DRIVEWAYS*

Dense-Graded Plant Mix (Specification No. 4) being applied to Penetration Macadam base for heavy-duty industrial parking area.

A private drive and subdivision street surfaced with Open-Graded Plant Mix (Specification No. 2).

Emulsified asphalt is a tested and proven material for paving driveways, parking lots, playgrounds, subdivision streets, walks, and similar areas. In addition to the cold-mix process specifications previously available for paving projects of different types, *Mastic-Mix* (Specification No. 11) and *Driveway Construction* (Specification No. 12) are the latest in the list of emulsified asphalt specifications available from McConnaughay Licensees. *Mastic-Mix*, designed for use as a surface coat over one of the standard mixes, is laid by machine, trowel, or broom to form a smooth, tough, resilient pavement . . . highly resistant to wear, water and heat, yet surprisingly economical. The specification for *Driveway Construction* covers construction methods recommended for use with emulsified asphalt.

Information on the specifications above or any of those in the box at right will be mailed immediately at your request. You can be sure of getting accurate information and fast, dependable service on asphalt emulsions and mixes by calling any of the McConnaughay Licensees listed. Take advantage of this exceptional service. Get in touch with your nearest McConnaughay Licensee or contact . . .

McCONNAUGHAY LICENSEES
Operating K. E. McConnaughay Emulsified Asphalt Plants

Albany Asphalt & Aggregates
75 State St., *Albany, New York*

Knight Paving Products, Inc.
1655 Union Rd., *Gardenville, N. Y.*

Knight Paving Products, Inc.
Vine Street, *Ithaca, New York*

Knight Paving Products, Inc.
1980 E. Ave., *Rochester 10, N. Y.*

Knight-Bitumen Corp.
Watertown, New York

Seaco, Incorporated
2700 Industrial Drive, *Columbia, S. C.*

E. A. Mariani—Emulsified Asphalt
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Wabash Valley Asphalt Co.
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Brookman Construction Co.
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Fauber Construction Co.
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Asphalt Materials & Construction, Inc.
960 E. 22nd, *Indianapolis 2, Ind.*

Ready-Mix Asphalt, Inc.
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Walsh & Ikeler
R. R. #2, *Gary, Indiana*

Bituminous Materials Co.
416 S. Water St., *Jackson, Mich.*

Bituminous Materials Co.
318 Atlantic St., *Bay City, Mich.*

Emulsions, Inc.
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Bituminous Materials & Supply Co.
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Berkshire Asphalt Co., Inc.
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C. C. Plumb, Elmwood Station
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John A. Dow
157 Church St., *New Haven 10, Conn.*

SPECIFICATIONS OF THESE COLD-MIX PROCESSES AVAILABLE ON REQUEST

1 – Penetration Macadam, 2 – Open-Graded Plant Mix, 3 – Open-Graded Road Mix, 4 – Dense-Graded Plant Mix, 5 – Dense-Graded Road Mix, 6 – Mat Coat, 7 – Seal Coat, 8 – Sand Mix, 9 – Sand Honing, 10 – Patching, 11 – Mastic-Mix, 12 – Driveway Construction.

K. E. McCONNAUGHAY LAFAYETTE INDIANA
EMULSIFIED ASPHALT *PLANTS AND PROCESSES*

. . . for more details circle 217, page 16

VIEWS AND COMMENTS

By H. G. Nevitt

Mix Design and Control — a Team Job

IN A PREVIOUS issue we took the position that some fundamentals were of such far-reaching importance as to concern everyone. We wish to now discuss what we believe is an excellent example — the design and control of bituminous mixes.

This phase of flexible road construction has developed somewhat obviously, at least in the low cost field. At the start the engineer made responsible for the project was more or less on his own. Guided by such formulae, grading curve requirements and other data that he could learn about, he determined the gradation and bitumen control. Their control in the field was a rather haphazard affair, with the final decisions likely to be based on the appearance of the surfacing as laid down and (if practicable) subjected to traffic.

Needless to say, there were a fair number of failures, much corrective work required, and a considerable burden placed on maintenance.

Gradually the situation improved. Tests were developed and design procedures formulated. The materials and design organizations gradually took over the mix formulation and (to varying degrees) the control. Today most organizations set the general procedure to be followed by the construction engineer, and attempt to tell him whether the desired characteristics are being obtained in the finished surfacing. These basic design procedures are very much in dispute, with the proponents of each method attempting to refine it to the point where it meets all requirements. Likewise control techniques are recognized as being in a state of development.

Nevertheless, the general attitude seems to be that this phase of the art is fairly well under control, and that further concern with it should be left to the experts. It is our own belief that this is a very questionable conclusion, not supported by a careful and objective review of the basic facts. We will attempt to outline the background for this thinking.

We do not believe that the administrative, the construction or the maintenance groups should give up all participation in deciding the vital matters of design principles or job control. Authority to investigate, propose, and carry out the detailed program must of course be delegated; but it should in its over-all aspects be a team job, with the final policy decisions very much the concern of the whole organization. For today these determine the final results obtained. Material procurement, construction, and other phases all offer serious problems, but they are generally capable of solution and rarely affect the final results obtained unless obvious and preventable errors or omissions occur.

If, however, the mix is improperly designed or controlled, the construction and maintenance forces can do their utmost to no avail. They consequently should have some say as to these procedures; and, correspondingly, if only in self defense, should be interested and informed to the point where their views can represent a real contribution.

Another Important Reason

There is a further reason that maintenance and construction men should take an active interest and participate in determining design principles and procedures. Many modern design methods are essentially formulae processes. An engineer supplied with the designated laboratory data can sit at a desk and set the design without inspection and consideration of many material and field factors. We are tempted to say that they encourage this. The construction and maintenance of such a surfacing may, however, be an entirely different matter — at least if a satisfactory job is to result. And this does not necessarily mean that the design principles or decisions are wrong. It may simply require that the construction and maintenance forces clearly understand what these call for in the mat, so that they can be supplied. Of course, to do this they will probably need tests on the mix actually being obtained, so that the further factor of proper field controls — along with their significance and application to the field conditions — is brought in.

We are not implying that construction men build, and maintenance men attempt to repair, jobs which superficially meet the design specifications but do not function as the designer intended, although examples of this are not infrequent; we merely point out that, to get the surface the designer intended, these people must understand the basic principles of the design method in order to interpret and contend with the varying conditions encountered in the field in such fashion as to produce it. The resulting surface will usually be statisfactory if this is done despite the need for betterment in design procedures that will be discussed in a later issue.

Building bituminous pavements is a manufacturing job even though much of it is done in place. To produce the best possible article the several teams who combine their talents to do so must understand the needs of the end product, how they will be met in this particular operation, and the part each team must play in making it. All are concerned, all should help on the over-all decisions which determine both the finished product and its suitability for the intended functions, which is essentially its quality. For high quality with maximum economy their combined talents will be none too much.

Engineering group against unions

Employment problems between management and engineers should be solved by getting together rather than by unionizing engineers. So stated leaders in the National Society of Professional Engineers in a recent pronouncement on the subject.

The Society declared in a report that "professionalism and unionism are incompatible concepts." The report said that the recent emergence of a National Federation of Engineers, dedicated to unionizing their profession, has brought a "long-smoldering controversy into the open as never before." It is that the unionism has promoted the enemy concept between employee engineers and management.

Quoting the report further, "our studies have led us to the conclusion that there is no need for dividing engineers and the management into separate armed camps. The over-all problems can be most satisfactorily solved by cooperative effort."

Minnesota Bituminous Program Reviewed

Sixteen contractors using twenty-one plants took part in four hundred miles of plant mixed projects — three contractors with six plants producing 57.8% of the production

EACH winter, the engineers in the Division of Materials and Research of the Minnesota Department of Highways, review the bituminous work done in the state during the preceding year. ROADS AND STREETS has published several of these reviews, which often analyze the results in quality control and trends in types of project, and look for common denominators and special problems which will help guide the engineers in the planning of future work.

The 1954 program was given a detailed review of this nature recently by D. R. McFadden, Bituminous Engineer in the department working under John H. Swanberg, Engineer of Materials and Research.

A total of approximately 18,000,000 gallons of liquid bituminous materials and 39,000 tons of asphalt cement was used on state primary and secondary work during the 1954 construction season. A total of 800,000 tons of hot plant-mix construction was placed.

The department report includes tabulations of all essential data pertaining to each project, data being recorded under 50 or more headings including a complete listing of the different sieve sizes for aggregates and other pertinent details that will help judge the work or trace causes of defects that develop, etc.

Hot Plant-Mix Production

The plant mix production for the 1954 Minnesota season consisted of the following:

Spec. 2351 — Hot Asphaltic Concrete	99,343 tons
Spec. 2341 — Plant Mixed Surface (Divided Aggregate)	237,669 tons
Spec. 2331 — Plant Mixed Surface (Single Aggregate)	462,966 tons
Total	799,978 tons

Sixteen bituminous contractors using twenty-one hot-mix plants, eight batch type and 13 continuous mix type, participated in the plant mix production during the past season. Three of the sixteen contractors using six hot-mix plants, produced 57.8 per cent of the total production.

The eight batch-type plants produced 25 per cent of the total production. Average production per plant for all plants for the season was 38,100 tons. Total production for individual plants ranged from a low of 6,500 tons to a high of 103,000 tons. 9 of the hot mix plants, 1 batch type and 8 continuous mix type, produced in excess of the average.

Approximately 74 per cent of the total production for the season was produced during the months August, September and October.

Control of Bituminous Plants

Studies conducted on mixtures produced by each hot mix plant indicate a greater variation in the asphalt content than anticipated. In order to provide for corrective measures in subsequent hot mix productions, a total of 913 bituminous mixture samples was analyzed. A detailed analysis of these samples was conducted in addition to an analysis of pertinent information shown on the plant and street reports. With very few exceptions, it was found that all of the plants produced mixtures having about the same variation from the recommended bituminous proportions.

From the above study it was determined that approximately 60 per cent of the samples fell within the desired plus or minus 0.25 percentage points of the recommended bituminous contents regardless of type of mixing plant used, proficiency of the operator or the quality of the inspection. 40 per cent of the samples showed a wider variation in bitumen content than desirable from the standpoint of laboratory design criteria.

An examination of the job graphs does not indicate that there is anything particularly amiss in the sampling and the gradations of the extracted aggregates do not vary markedly from the average gradations for the job.

Bituminous Material for Mixture

Asphalt cement was used in all hot-mix production during the 1954 season. Grades ranged from 85 to 100 penetration used in Hot Asphaltic Concrete to 200-300 penetration, used in single aggregate type mixtures. The 150-200 penetration grade was the most predominantly used in divided and single aggregate mixtures.

Riding Qualities

Roughness recordings were run on 347 miles of new hot plant mix surfaces constructed during 1954, involving thirty-three projects. Roughness, as measured in inches per mile, ranged from a low of 48 inches on one project to a high of 75 inches on another project. Average roughness for the 347 miles was 58 inches per mile. Seventeen projects for a total of 181 miles or 52 per cent of the mileage run showed a roughness less than the average of 58 inches per mile. It might be noted that one individual contractor produced three of the lowest roughness recordings of 48, 49 & 50 on three separate projects.

Roughness recordings were also made on 88 miles of road mixed type surfacing involving eight projects. Roughness ranged from a low of 107 inches on one project to a high of 144 inches on another. Average roughness for the 88 miles was 121 inches per mile. Five of the eight projects, or a total of 57.5 miles had roughness recordings below the average of 121 inches per mile.

Number and Mileage of 1954 Bituminous Jobs in Minnesota

Type of Construction	*By Construction Division*	*By Maint. Div. Contract*	*By Maint. Div. State Forces*	*F.A.S. By Counties*	*Total*
Spec. 2351 Hot Asphaltic Concrete	23	2	—	—	25
Spec. 2341 Hot Plant-Mix Surface (Divided Aggregate)	67	—	—	1	68
Spec. 2331 Hot Plant-Mix Surface (Single Aggregate)	293	—	2	12	307
Spec. 2321 Road Mixed Surface	132	68	547	307	1054
Spec. 2207 & 2208 Road Mixed Base	239	—	40	120	399
Spec. 2356 Heavy Seal with Cover	42	10	—	66	118
Spec. 2357 Light Seal with Cover	309	756	222	24	1311
Spec. 2356 (Mod.) Double Seal with Cover	6	—	—	—	6
Fog Seal without Cover	119	17	182	162	480

Alkali lignin protects against jet fuels

In February of 1954, a new use for alkali lignin stabilizers was patented — a use which according to a West Virginia Pulp and Paper Co. spokesman, should interest airport engineers.

Since the advent of the jet plane, the problem of protecting the asphalt pavements of airports has become acute. Fuel spillage surrounding the loading and take-off areas for jet planes seriously injures the structure of asphalt runways, taxi areas and loading zones. The fuel used is similar to kerosene or crude gasoline readily softens and dissolves asphalt causing disintegration of the paving mixture.

Coal tars and coal tar pitches have been found more resistant to the solvent action of jet fuels than asphalts, and it is desirable to handle them without heating in an emulsion form. Emulsions of this type now on the market are made with the aid of clay. However, they cannot be sprayed by commonly available equipment such as distributor trucks, ordinary paint spray equipment and the like because of the consistency of the emulsion due to the clay and the coarseness of the dispersed tar. In addition, these coal tar emulsions are not compatible with rubber latices, and cause breakdown of these latices when mixed.

Satisfactory coal tar emulsions have been prepared using alkali lignin as the emulsifying agent. The coal tar is dispersed in a solution of alkali lignin to form an emulsion of the oil-in-water type. This solution also contains a thickening agent such as an alkali metal salt of carboxymethyl cellulose. The resulting emulsion is characterized by good stability, unreactivity and a dispersed coal tar of fine particle size.

In addition, the coal tar emulsions prepared with alkali lignin are capable of being mixed with additional ingredients to render them suitable as oil, or solvent and heat resistant surfacing or resurfacing material for roads, pavements, airports, etc.

Notes on Michigan asphalt paving conference

The 3rd annual conference on asphalt paving sponsored by the Michigan Asphalt Paving Association and the Asphalt Institute had a lively one-day session at Michigan State College, East Lansing, March 31.

In a report on Detroit's bituminous resurfacing program, Jan Schmedding, Detroit superintendent of street maintenance and construction, revealed that the city's bituminous resurfacing work is almost evenly split between contractors and municipal forces. For an annual total of 75 miles street work, contractors have resurfaced about 40 miles and the remainder was done by city personnel. Average unit costs per sq. yd. for recent work were given as follows:

	Single Course	*Double Course*
City forces	$1.48	$2.68
Contractors	1.57	2.47

In a paper on control and inspection of bituminous concrete, W. J. Worth, testing engineer, Wayne County Road Commission, emphasized several important personal viewpoints which are here summarized.

- Quality control should not be a policing action, but should be an effort to get excellence.
- Good specifications and inspection are interlocking elements of quality control. If quality is not specified, it cannot be enforced.
- Assurance of aggregate quality is not as great a problem as that of asphalt quality. Much confusion would be eliminated by designating clearly the asphalt specified and using the term of "asphalt cement" with its penetration values.

Crusher Run Gradation Corrected in the

Under Idaho specifications, which forbid scalping screens, this contractor corrected the ¼-10 fraction in the screen compartment of the hot-plant gradation control unit

WHAT to do about a pit-run gravel — which, with oversize stone broken and mixed in, was too heavy in the size between the ¼-in. and the No. 10 screen — was a problem on the project here described. The project was an 11-mile surfacing job on U. S. 30 between Georgetown Summit and Soda Springs, Idaho. Completed in 1954 by Holmes Construction Company, of Heyburn, Idaho, the work consisted of placing 0.2 ft. of Class "B" bituminous hot plant-mix laid in one course. Class "B" in Idaho is one of three standard surface mixtures used with gravel aggregate.

Otherwise in other respects it was a typical surfacing job on a crushed gravel (¾ in. minus) base. The cross-section shown herewith gives the geometric design details. The old road with a temporary surface treatment on it was scarified, leveled up and brought to grade, soft spots were removed, and backfilling done with select materials. Material for the 6-in. gravel base was placed with spreader boxes on dump trucks, watered and rolled, then primed. A light coat of sand was spread over the priming to prevent pick-up of the asphaltic prime by passing vehicles.

The Aggregate Problem

Because of the large amount of oversize rocks in the gravel pit, a portable gravel crushing and screening plant was required. Idaho specifications require the entire volume of oversize material to pass through crushers except boulders too large to go into the crusher. This means that all material that went through the grizzly also went through the crushers. Crushed gravel dropped back onto the stockpile supply belt to be remixed with the supply.

The contractor stockpiled all aggregate prior to putting it into the hot-mix plant. Table 1 gives gradation analyses which shows that about 5 percent of the stock piled material between the ¼ in. screen and the No. 10 screen had to be rejected.

Notice that the percentage passing the ¼ in. screen is near the maximum allowed while the percent passing the No. 10 screen is near the minimum allowed. The average quantity of specification material would be 53% (half way between 48%, and 58%) passing the ¼ in. screen, while the average quantity of specification material passing the No. 10 screen would be 35%. The difference is 18% to be retained between these screens. The stockpile analysis shows 25% between these screens. Instead of rejecting the whole difference, only 5% was required to be rejected. The rejection was accomplished by the hot-mix plant screens.

New Bituminous Plant

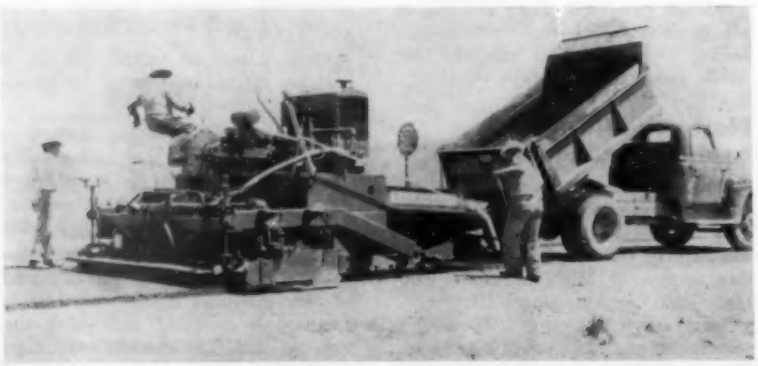
Another point of interest about the job is that the mixing plant was a new type, portable, continuous-mix plant manufactured by the Iowa Manufacturing Co. The plant included a Model MMA continuous mixing unit having up to 180 tons per hour capacity; a Model MGC gradation control unit with 4 bins; Model 8828-E drier unit with low pressure air atomizing oil burner; Model DS-88 dust collector unit; 24 in. by 40 ft. portable lattice frame conveyor, with motorized head pulley; and 24-in. reciprocating feeder with drive from conveyor tail shaft. All units are completely portable, with their own running gear.

Table 1 — Gradation Comparison

Screen Size	Stockpile	Specification
Percent Passing ¾ in.	100	100
Percent Passing ¼ in.	57	48-58
Percent Passing No. 10	32	30-40
Percent Passing No. 50	14	
Percent Passing No. 200	6	3-9

Table 2 — Sieve Tests for Separate Bins

Percent Passing	Bin Number 1	2	3	4	Complete Mix	Specification
¾ in.	100	100	100	100	100	100
¼ in.	100	81	27	4	53	48-58
No. 10	87	11	5	2	33	30-40
No. 20	60	6	3	0	21	
No. 40	43	4	2	0	16	
No. 50	37	4	2	0	14	
No. 100	26	3	2	0	10	
No. 200	16	3	1	0	6	3-9
To get the complete mix, the following percent by weight of each bin was used	33	17	20	30		



● Barber-Greene finisher spreading hot-mix.

Table 2 shows sieve tests of the separate bins of the gradation control units.

The Table 2 percentages were ob-

Hot-Mix Plant

tained by gate settings on the gradation control unit. Note that by rejecting 5% between the ¼ in. and the No. 10 (at the screen compartment of the gradation control unit) of the stockpile after passing through the drier into the 4 bins, the complete mix very closely adhered to the average of the amounts specified.

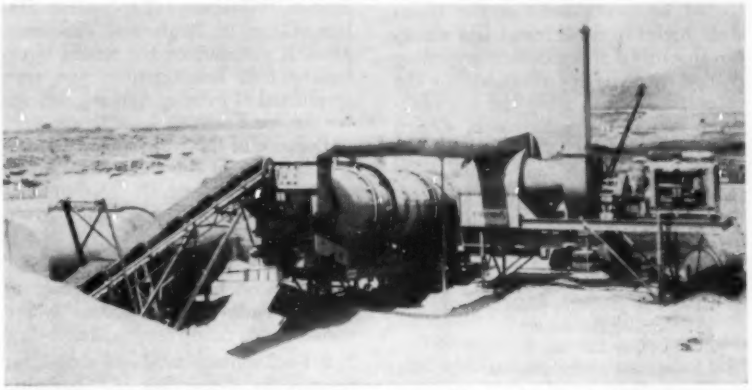
Since, due to heavy rains, the stockpile was quite wet, there was an unavoidable cost caused by rejecting process dried material.

From the gradation control unit the volumetrically proportioned material passed into the continuous pugmill over the 24-in. reciprocating feeder. While the capacity of the plant is rated higher, usually about 160 tons per hour of mixed material was hauled out onto the crushed gravel base. Five percent (by weight) of 120-150 penetration asphalt cement was used in the bituminous mixture. Extraction tests showed very close adherence to this specified requirement.

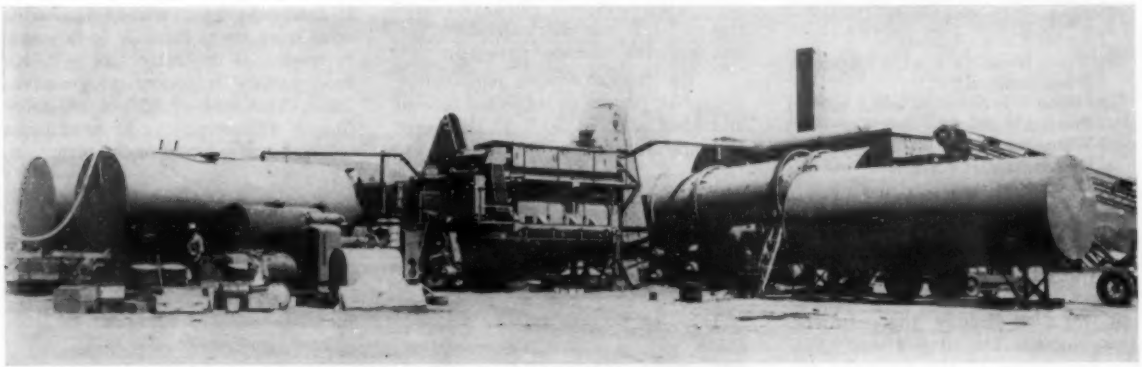
Table 3 gives the bid schedule submitted by the contractor on which

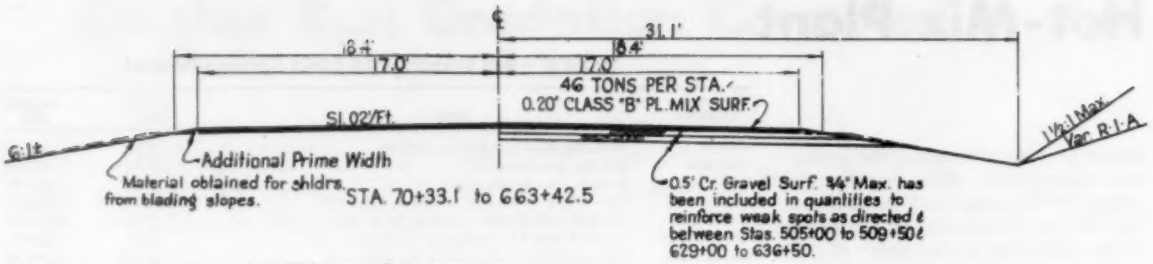
Table 3 — Bid Schedule on Soda Springs Project

Approx. Quantity	Item	Unit Bid Price	Amount Bid
900 M. Gal.	Watering base and surface courses	$ 0.50	$ 450.00
190 Hrs.	Rolling, power roller	5.00	950.00
110 Hrs.	Rolling, pneumatic roller	5.00	550.00
11.209 Mi.	Reconditioning existing roadbed, Class "B"	400.00	4,483.60
2,600 Tons	Crushed gravel surface course, ¾ in. max.	1.15	2,990.00
10,000 Tons	Crushed gravel in stockpiles, ¾ in. max.	0.50	5,000.00
60,000 Gal.	RC-1 asphaltic road material for prime	0.135	6,100.00
1,800 Tons	Blotter material, Class "A"	0.50	900.00
1,500 Tons	120-150 penetration asphaltic road material for plant-mix	30.00	45,000.00
27,000 Tons	Plant-mix bituminous surface, Class "B"	2.25	60,750.00
3,500 Tons	Cover coat material Class "3" in stockpiles	1.50	5,250.00
	TOTAL		$134,423.60



● (Above and below): Cedarapids new-type portable continuous hot-mix asphalt plant on the Idaho project.





● Cross-section showing typical Idaho resurfacing practice.

the Idaho Department of Highways awarded the job.

While discussing this project, it should be mentioned that the Idaho state highway department has much commended specifications regarding equipment. The specifications for the plant are open to allow the manufacturer to use his initiative in design and the contractor to use his ingenuity in procedures. As one engineer expressed it, "they can mix it in a wheelbarrow so long as they get the results desired."

Equipment Used

1 Portable crushing plant
1 Caterpillar D8 dozer
1 Caterpillar D6 dozer
2 Caterpillar motor graders
1 Esco ripper
1 Transport trailer-truck
1 Cherry picker (truck-mounted crane with A-frame and 2 hoists)
1 Cedarapids continuous mix hot-mix plant
1 Barber-Greene finisher
12 Dump trucks (4 Ford, 4 Chevrolet, 4 International)
2 Galion 8-12 ton steel wheel rollers
1 Pneumatic roller
2 Water trucks
1 Hough front-end loader
1 Distributor
2 Water pumps
3 Pickup trucks

The contractor on the Soda Springs job was Holmes Construction Company of Heyburn, Idaho. Superintendent was Dell Holmes, the president, Don Holmes. The project was under the jurisdiction of the Pocatello district of the state highway department; E. V. Miller, state highway engineer; C. A. Kelly, district engineer; Perry Axley, construction engineer; Ralph Beyer, project chief.

Latest on jet effects on asphalt pavement

Some of the doubts plaguing jet airfield designers regarding the use and performance of asphalt pavement may be dispelled by the latest findings of the U. S. Corps of Engineers. A report on this subject was presented at the recent annual meeting of the Association of Asphalt Paving Technologists by Charles R. Foster, chief, and Edward C. Meridith, engineer, of the Flexible Pavement Branch, Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss. It summarized the results of extensive field investigations and tests conducted at existing military airfields for the Air Force.

Because of the wide-spread interest and concern in the distinct problems created by jet aircraft, the summation portion of the report is here given with slight abridgements.

1. Jet blast is critical for hot-mix asphaltic-concrete pavements only at runway ends and on aprons where maintenance runups are made.

2. Fuel spillage produces significant distress in dense hot-mix asphaltic concrete only in parking areas and around refueling hydrants. The effect of jet blast and spillage in other areas (taxiways and runways except the ends) is not detrimental to hot-mix asphaltic concrete pavement.

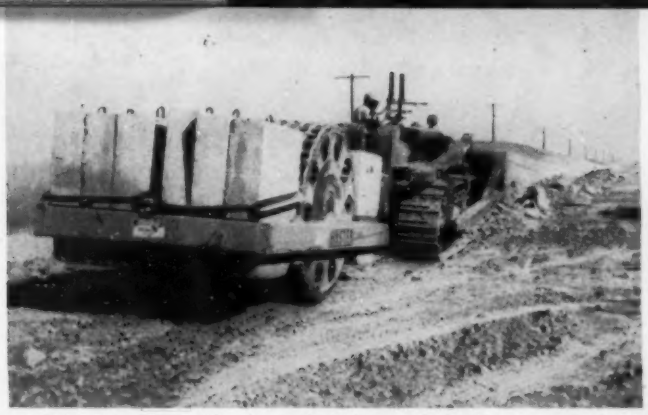
3. The critical erosion temperature of asphalt pavement subjected to heat and blast is about 300° F. Pavement temperatures of that magnitude are not developed by most of the U.S. Air Force planes operating today, except when afterburners are used. Operation of afterburners with the plane standing still produces high temperatures in the pavement and will cause erosion of asphalt if continued for any appreciable period of time.

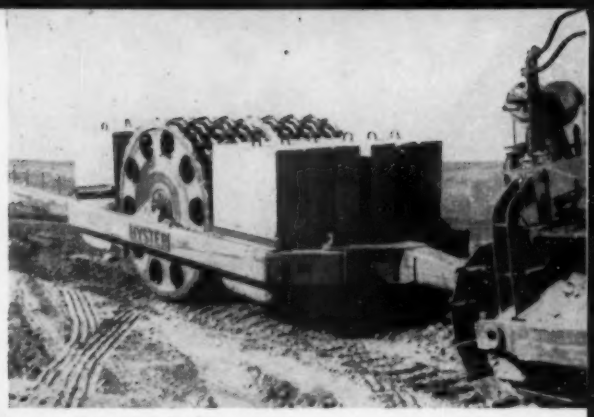
4. Occasional spillage of jet fuel on dense hot-mix asphalt concrete pavement is not detrimental. Repeated spillage, such as that occurring on parking and refueling aprons, is detrimental because the fuel leaches the asphalt cement from the aggregate. The areas affected are relatively small. A pavement resistant to jet fuel is necessary in those areas.

5. No completely satisfactory jet-resistant seal coats for asphalt pavement have yet been tested.

● Pennsylvania's 41,000-mile State Highway System (which includes what most states consider to be county roads), is the subject of a 2,713-mile surface treatment program for 1955. At a cost of $3,144,000 more than 6 million gallons of bituminous material will be used in the operation.

● Corps of Engineers' tests included altering vertical position of an F-80 plane to find critical height and angle of tailpipe. Pictured is the eroded area where temperature reached 325 deg. F. for one test position. Blast pattern is well defined because of wet pavement conditions. Pavement erosion was 12 ft. long, less than 1 in. deep, and had maximum width of 2 ft.





● (Left): Showing grid roller pulverizing sandstone for selected material base course to portland cement concrete paving job on Pacheco Pass road in California. Note size of rock ahead of tractor. (Right): Road base being compacted by grid roller after sandstone was pulverized.

How County Salvages Old Road Surfaces

ONE of the frequently occurring jobs on county and township road work is that of tearing up an old surface, be it bituminous, crushed rock, or gravel, so as to use the old material in the new surface to be built. The ripped up surface material is usually left in large chunks back of the ripper. These chunks must be reduced to specification size before new material is added; or, if no new material, before the bituminous material is mixed into it.

How Fresno County (Calif.) road officials solve this problem is described in the following notes. On several jobs visited for this report a Hyster grid roller was usually employed along to reduce the chunks to proper size. On one job, the county used a homemade road disc in conjunction with the roller; on a state job the roller was being used to reduce quarried sandstone chunks to specification size for selected base material on which a portland cement concrete pavement was to be placed.

Rebuilding Old Road

Out in the county among the vineyards west of Fresno, county forces were rebuilding a road called West Avenue. The soil is a clayey-silty-sand. The old bituminous mat that had been down for 10 years needed rejuvenation and widening. The standard county road paved width is 26 ft. On the more heavily traveled county roads near the city, a 36-ft. width is standard.

Construction Train. West Avenue was torn up with a ripper towed by a crawler tractor. The torn up surface (mostly large chunks) was windrowed to one side and a new subgrade bladed to standard width, first on one side before the old bituminous mat was broken down to gravel size, and then on the other side.

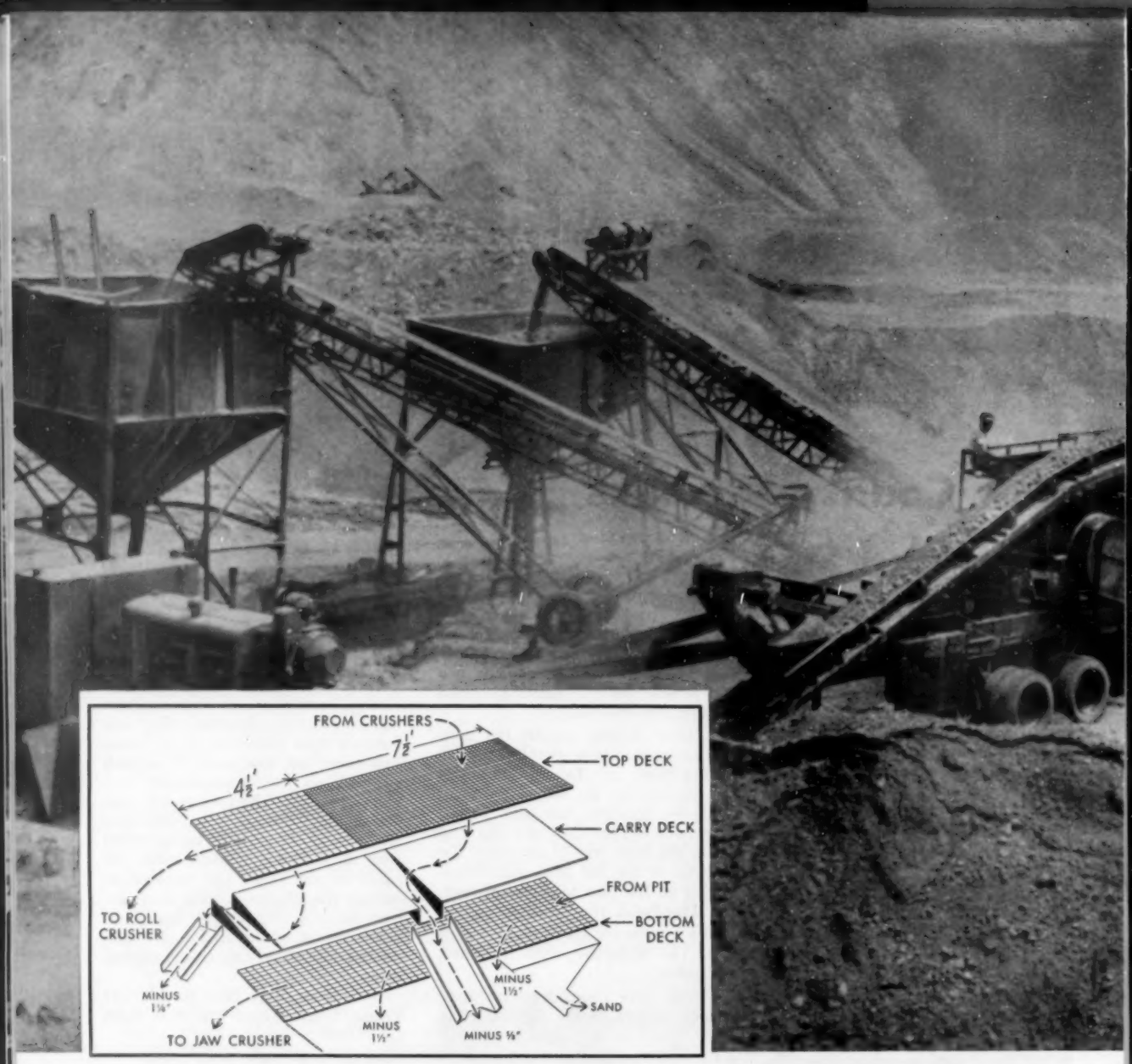
A train of four coordinated units was being used to accomplish the following steps: (1) Take a bite out of the windrow on the side of the road; or, if the windrow had been passed over once by the disc and the grid roller, the train was to turn over the material in the last pass. (2) Windrowing on last pass to center of road. (3) Disc-break the windrow chunks with a homemade Cardwell-Post road disc. (4) Pulverize with a Hyster grid roller.

Usually four round trips per mile sufficed to reclaim the old mat. The first two units were International Harvester crawler tractors towing self-powered pull graders. The third unit was a Caterpillar crawler tractor towing the Cardwell-Post road disc. The last unit was an Allis-Chalmers crawler tractor towing a Hyster grid roller. The old bituminous mat was 3 to 4 in. thick and 24 ft. wide. New clayey sand base material was to be mixed with the reclaimed mat and sweetened with cut-back asphalt.

The base material is so uniform and so extensive over the valley that foreman Bob Cardwell knows from experience just how much SC asphalt cut-back to use, approximately 0.5 gal. per sq. yd. The new surface was laid in three lifts to 9 in. thickness, 26 ft. wide, each lift being rolled with an 8-12 ton tandem roller. All roads in the valley are surfaced to protect the vineyards from dust carried diseases. The county has about 4,300 mi. of county roads. No side ditches are used in this irrigated valley.

Bullard Avenue. This particular Fresno County road was two miles

● Cardwell-Post road disc, part of the construction train, was built in the county shops. Welded hard facing armors the cutting edge of the 30-in. discs.



Duplex plant produces for three jobs at same time

SIMULTANEOUSLY TURNS OUT TWO SIZES OF FRACTURED STONE TOGETHER WITH CONCRETE AGGREGATES OR ROAD GRAVEL

If you are a contractor or gravel producer you'd probably be satisfied if your portable plant could produce 100% crushed material meeting a given set of specifications . . . and you'd probably feel that the plant would be doing all you had the right to expect of it.

To produce this 100% fractured material with an ordinary duplex plant you'd most likely have to use an auxiliary screening unit ahead of your duplex so all your material fed to it would be crushed.

But Fred Ward isn't so easily satisfied. In a pit near Detroit, Michigan, he's turning out two different sizes of fractured rock to meet the rigid specifications of the State Highway Department. In addition, he's producing road gravel.

. . . and at times, he's producing all 3 products simultaneously . . . with one portable plant!

State specifies fractured rock

Michigan, like so many other states, is recapping a considerable mileage of old pavements with asphalt materials. The State Highway Department requires that these materials contain 100% fractured particles in order to give the asphalt mat a definite stability.

According to present state specifications, the base course must be rolled to a 1½" mat and must contain minus 1¼" products with 0-10% passing a #4 mesh (Spec. 9AA).

⅝" minus rock for top mat

The top mat must also be made up of 100% fractured material, all of it passing ⅝", with 0-10% passing a #10 mesh (Spec. 25A).

And to further complicate matters, Ward had to meet these specifications from materials retained on a

1½" screen, leaving a considerable proportion of the pit-run to be disposed of.

How problem was solved

Fred Ward solved his problem by bringing in a PIONEER 46VE Bottom Deck Feed Plant.

Pit-run material is fed to the *bottom deck* of the 46VE's 3½ deck vibrating screen. Here, all material passing the 1½" mesh is removed and can be delivered to a nearby washing plant for washing, sizing, and stockpiling for use as concrete aggregate or road gravel.

Rock retained on the 1½" screen then passes through the 1036 jaw crusher which is set at approximately 2¾". The 2¾" minus material is then sent to the 12′ top deck.

Here, the first 7½′ of the deck is equipped with ⅝" openings, the last 4½′ with 1¼" openings.

Oversize is fed to the 4022 roll crusher set at slightly less than 1¼" in a closed circuit with the top deck.

The unusual sizing job was accomplished with only two modifications to the standard PIONEER 46VE. *First*, built-in chutes in the center deck were sloped from one side to go across the screen so that ⅝" minus rock would be delivered to one side and 1¼" minus to the other.

Second, the chutes were flared from the side of the plant to feed into PIONEER Portable Conveyors which delivered material to bins (see photo).

Engineers who have visited the site agree that *no portable plant not employing the Bottom Deck Feed principle* would possess the versatility and precise control of gradation necessary to produce the varied specification materials simultaneously.

Available in 7 sizes

PIONEER Duplex Plants, featuring Bottom Deck Feed, are available in 7 different sizes. For further information, write Pioneer Engineering Works, Inc., Minneapolis 13, Minnesota (subsidiary of Poor & Company, Chicago) or your nearest PIONEER Distributor.

Pioneer
Continuflo EQUIPMENT

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Cold Mix
Over 50 tons per hour with the 840-B *Mixer.*

Intermediate Hot Mixes
Up to 45 t.p.h. with *Mixer and Dryer.* (Shown with Cold Feeder.)

High-type Multiple Aggregate Mixes
Up to 45 t.p.h. with *Mixer, Dryer and Gradation Unit.* (Shown with Cold Feeder.)

NEW . . . Big Plant Flexibility at Low Initial Cost

WITH THE

NEW Barber-Greene 840-B Bituminous Plant

For a realistic low-cost initial investment you can have a plant that has the versatility for all kinds of jobs . . . from driveways to highways. The new 840-B interlocks aggregate and bitumen feeds for constant correct proportioning. The new, longer twin-shaft pugmill assures thorough mixing and increased capacities. Hydraulically operated pugmill discharge hopper allows plant to operate between trucks, and prevents mix segregation. The new high discharge lets trucks drive right under the hopper . . . eliminates a truck pit or special loading conveyor.

And this plant can travel. All units are mounted on pneumatic tires for towing at truck speeds. Adjustable jacklegs speed plant setup . . . eliminate cribbing.

Choose the Plant to Meet Your Needs

For an attractive initial cost you can have the new 840-B Plant you require. The mixer alone will set you up to produce stabilized base and cold bituminous mixes. Then, by adding other integrated Barber-Greene units—such as the dryer, gradation control, and dust collector, your plant can produce mixes to meet any specification. Check this new money-maker today.

55-4A-B

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● Construction train breaking down large chunks of old surface to specification size.

long. The old cross-section 28 ft. wide with a 2-in. thick old mat. When completed, the new road surface was 28 ft. wide and from 2½ to 3 in. thick. Costs on this job were as follows:

Ripping and pulverizing (grid roller):

Labor	$ 165.12
Equipment rentals	184.00
Total	$ 349.12

Completing whole job:

Labor	$ 405.52
Equipment rentals	467.00
SC-3 asphalt	2,004.00
	$2,876.52
Plus 17%	489.00
Total	$3,365.52

Four days were required to rip and pulverize the old surface for the two miles for the cost shown above. The 17%, added above, according to W. A. Sharer, road foreman, Dist. 2, of supervisor Foley's district, covers sick leave, workmen's compensation, vacation, overhead, etc.

Shepard Avenue. This Fresno County road was four miles long. The old surface before starting reclamation work was 20 ft. wide and from 1 in. to 2 in. thick. After it was completed the surface was 24 ft. wide and from 2½ to 3 in. thick.

Cost of ripping and pulverizing old surface (using grid roller):

Labor	$ 330.24
Equipment rentals	368.00
Total	$ 698.24

Eight days were spent in ripping and pulverizing the 4 miles.

Total cost of road work:

Labor	$ 910.96
Equipment rentals	1,155.00
SC-3 cut-back asphalt	4,000.00
	$6,065.96
Plus 17%	1,031.21
Total	$7,097.17

The 17% is for the same items as shown in previous table of costs.

Equipment Rental Rates

Following are rental rates charged by Fresno County against jobs on which they are used:

Unit	Per 8-Hour Day
Medium sized crawler tractor and 8 cu. yd. scraper	$32.00
Medium sized crawler tractor	20.00
Small crawler tractor	16.00
Medium truck	10.00
Small truck	8.00
Pickups	5.00
Scarifier	5.00
Motor grader (12 ft.)	22.00
Rotary mixer (power take-off)	15.00
Rooter	5.00
Roller (8-12 ton tandem)	12.00
Power shovel (¾ yd.)	28.00
Bulldozer (blade only)	3.00
Tilt trailer	6.00
Air compressor (105-125 cfm)	8.00

SC-3 cut-back asphalt includes hauling and spreading $4. per bbl.

On the Pacheco Pass road which was under construction by the state highway department, the contractor, Richards, Inc., of Fresno, Calif., was placing a specified 10 in. thick selected material base course, in two 5-in. lifts, on the soil subgrade. Supt. Gale Zimmerman said that the grid roller which was towed by an International Harvester TD18A diesel crawler tractor, was breaking the quarried sandstone down to specified maximum size. A Caterpillar motor grader was used to rewindrow the broken windrow after each pass of the grid roller. The accompanying pictures show how well the job was accomplished. Besides breaking down the large chunks seen in the picture, the roller did a good compaction job.

For Fresno County, Carl Lind is the public works commissioner; Al Reyburn, general road superintendent; W. A. Sharer, road foreman of Dist. 2; Norman Foley, county supervisor from District 2. For the West Avenue job, Bob Cardwell, road foreman; Sid Cruff, county engineer.

● Grid roller compacting newly built fill on county road northeast of Fresno, Calif. W. A. Sharer, road superintendent, Dist. 2, discussing operation of the Hyster roller with Bob Jockers, distributor's representative.

The Third Dimension in Paving

By H. Seivert
Corps of Engineers, Foundations and Materials Laboratory
Washington, D. C. District

Editor's Note: Readers who have been following Mr. Nevitt's Views and Comments page each month will find much food for thought in this provocative comment. Further constructive discussion is invited

IN VIEW of the respect one feels for Mr. Nevitt, it is with temerity that one differs with him. Yet his repeated opinion that asphalt paving must be flexible, most fully stated in his December 1954 editorial, requires an answer.

He mentions, and I quote, "Gradations which result in aggregate interlock such as to make flexible adjustment of the surface difficult or practically impossible. . . Such mats functions very well as long as there is sufficient base support to require negligible adjustment of the mat, they are often striven for rather than avoided." Granted that as he says, no one wants totally rigid, inflexible mats or under-asphalted mixes; is it not time, now to admit that a new bituminous paving type, dense, heavy-duty hot mix concrete has evolved?

It seems to me that for first and second class roadways, "such mats" should be striven for — hard! These are the dense, ideally graded concrete of maximum support value which are the equal of any pavements now in use.

They represent asphalt's bid for the future, and have paramount virtues not offered by other materials: jointless, vibration-free riding quality, quiet, elastometer type traction between two similar materials, the property of surface improvement from use, minor properties of annealing and healing; support value for all present or anticipated highway loads, coupled with savings which have been poorly advertised. That is, reduction of pavement to its proper function of wearing surface, permits maximum use to be made of cheap base materials so that pavement can be relatively thin.

If this were not enough, there is immediate use of the new surface redesign by adding support value at once; cheaply, in exactly the proportion desired. One inch or several can be added with perfect bonding and fusion. Both placement and maintenance are rapid and cheap. Typical large project economies of 10% to 20% have been shown with this construction. Total road structure savings of 30-40% are possible where good base materials, close at hand, are used by men thoroughly familiar with this form of work. Simplified redesign with perfect bonding will make re-

(Please turn page)

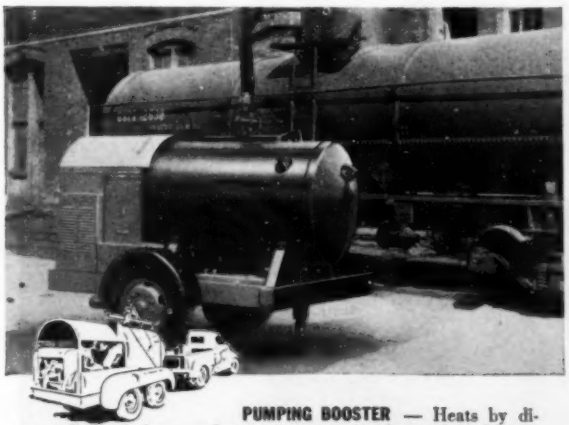
"You get FAST ACTION — to the job... on the job"

... with Cleaver-Brooks oil and bitumen heating equipment!

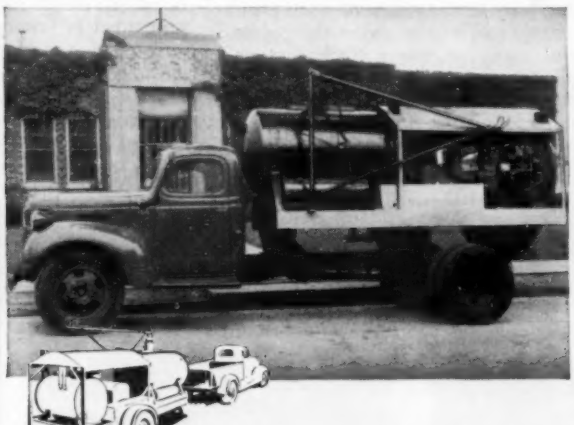
These self-contained mobile units can be ready to pump, heat and circulate bituminous materials in 20 minutes or less after arrival

If your job can be reached on wheels, any one of these famous Cleaver-Brooks mobile heating units can save you plenty of time and money. Each can be transported as easily as you drive your car . . . put into operation with minor connections — by only one man! Their proven high efficiency, man hours saved, plus elimination of field problems can be important factors in your profit picture. That's why you'll want to know more about famous Cleaver-Brooks Tank-Car Heaters . . . Pumping Boosters . . . and "Deuce" combination tank-car heater and pumping booster. It's the mobile bituminous team that does more work . . . with faster heat, higher temperatures and with less fuel. Write for details. Cleaver-Brooks Company, Dept. F, 395 E. Keefe Avenue, Milwaukee 12, Wisconsin.

TANK CAR HEATER — Shoots steam through tank-car coils at 125 lbs. pressure in 20 minutes or less from a cold start. Can be kept going at full tilt all day. Oil firing plus extra high-heat transfer design, assure extra fuel savings. Turbine-type condensate return means less water required. Available in two-car (28 BHP) and three-car (42 BHP) sizes, trailer and skid-mounted models. Ask for Bulletin RM-110.



PUMPING BOOSTER — Heats by direct firing 4 times as fast as steam, recirculates, then delivers bituminous materials directly to distributor. Heats only the amount of material required — not necessary to heat entire car. No steam or water required for operation. Has self-contained fuel and gasoline tanks. Available in two sizes, trailer and skid mounted: No. 1A Booster heats approx. 300 GPM temp. rise 25°-35°F; No. 2 Booster heats approx. 350 GPM temp. rise 45°-55°F. Ask for Bulletin AD-109.



"DEUCE", COMBINATION TANK CAR HEATER AND PUMPING BOOSTER — It's a portable steam boiler *and* direct-fired heater mounted on a single frame. Look at this three-job versatility! "Deuce" steam preheats one car to pumpable consistency while circulating and heating a second car to application temperatures. Same unit also pumps and loads distributor or transfer truck. Ask for Bulletin AD-109.

Cleaver-Brooks

Pioneers and Originators of Self-Contained Boilers, Tank-Car Heaters, Pumping Boosters, The "Deuce" and "Peak-Temp"

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pair and widening cheaper than is now realized.

Consideration of asphalt paving only in terms of flexibility has at this date a smell of obsolescence about it. It ignores modern soils engineering, heavy equipment compaction, CBR and triaxial design systems. The question — what is a road builder if not a base builder? — is neither asked nor answered.

Without destracting from the yeoman service which has been, and will long continue to be rendered by vast lengths of assorted flexible paving types, it should be stated that they are obsolete for main highway use, and ought not to be considered for major new construction. Essentially, such pavements fill a dual role being flexible base combined with wearing surface. With proper structural design for modern loadings and speeds, such duality is not needed. The material which will fill both needs tends to perform both, poorly.

Flexibility Creates Problems

If bases are expected to deform differentially, and pavements with them, the impact and drop effect of repeated wheel loadings must aggravate this deformation, most especially in the paving section. Pavement flexible enough to deform vertically, will also, unfortunately deform horizontally. And what highway department wants even minor sags, followed by shove humps on its paved surfaces?

In its aggravated form as a maze of humps and hollows characteristic of macadam over a weaving base, flexibility is the source of widespread disapproval which makes the public, and many engineers think that asphalt is a poor material — or at best only a secondary material, fit only, to provide quiet riding surfaces when supported by rigid pavement.

That this is not true, can be seen by examination of shipyard, airfield and military road, asphalt concretes which support enormous loads without deformation. If we accept the fact that very flexible pavements are satisfactory under pleasure cars — that certain over-asphalted dynamic load pavements have proven satisfactory under trucks, how far are we warranted in designing for flexibility?

The answer is, not very far — save for temporary use; not at all on Class I or II main highways; never on turnpikes or thruways.

Just as the portland cement industry has come to concede that granular base materials are needed to support its slabs under modern loadings, so must the asphalt industry concede that flexibility must be limited.

A third factor, a virtual new third dimension is now irretrievably fixed in the paving picture; graduated base design of proven support value is here to stay! It becomes increasingly idle to consider roadways in terms of rigid slabs or flexible mats. We must think of them now in terms of Support (Base) to the required figure, and then consider what is the best and most economical wearing surface. It is only for light traffic uses that paving mat and roadway are synonymous any more.

Flexible pavements will continue to represent about eight-tenths of American paving. But in that use they should be viewed as base, or increments of stage construction which will someday have a permanent non-displacing surface, for this eight-tenths of all pavement must be continually up-graded in support value.

In view of the wide benefits inherent in a universal road system, it does not appear that we will ever have consistently separated road systems divided into truck and light traffic routes.

There is no general tendency for speeds to lessen or loads to lighten. One may be amused to see a big-city department store van making a delivery on a country hill 170 miles from the store. But he scarcely notices the milk tank truck, the oil tanker, the loads of brick, the familiar big semi-trailer seen deep in the country. The incidence of such loads on country roads will increase.

Realistic roadbuilding for the future must involve maximum use of modern equipment, design trends and the cheap materials made available by big equipment. The trend is away from flexibility.

Author's Note: Flexibility is a most desirable property, but until tougher asphalt cements of satisfactory ductility, and new media to assure flexibility without lateral displacement come into use, its characteristics make it increasingly dangerous as traffic density and weight increase.

Rope for confining edge

A useful device not seen very frequently in placing asphaltic mix is a piece of old fashioned rope for confining the edge. The accompanying pictures show a 1½-in. rope being used for this purpose on the Garden State Parkway, by Reid Contracting Co., of Woodbridge, New Jersey, working under Standard Bitulithic Company on asphaltic surfacing.

The rope used, 1½ or 2 in. diameter and a couple of hundred feet long, was found particularly useful on transition sections where hand raking had to be substituted for mechanical spreading. The rope made it possible to leave a sharply defined edge to the surface mix, instead of feathering out. The rope is taken out as soon as the mix has set up enough to hold, and care is, of course, necessary to keep the roller operator from crushing the rope where he is working too closely behind the rakers.

● How hemp rope was used to help get a good edge for surface course.

"Why Koppers fleet uses Etnyre..."

The Etnyre shown above is priming a road near Alabama, New York with "Tarmac® RT-2." After covering with stone, it will be sealed with "Tarmac RT-8," covered with stone, and rolled. This work is being done by Koppers Company, Inc., of Pittsburgh, Pennsylvania, one of the large manufacturers of road tars in the nation. For the past twenty-five years Koppers has used Etnyre "Black-Toppers."

An Etnyre is one of the most modern pieces of equipment used on the road. The 3400-gallon Etnyre has low-pressure burners, keeping the material hot and ready for distribution on arrival at the job, effecting time saving of 60%.

Other features include the accuracy of application; rapid changes in the rate of application; even coverage without "wet" or "dry" spots; instantaneous shutoff with the full circulating bar which prevents drippings of the material; and freedom from repairs.

The combination of Tarmac and Etnyre is ideal—time is saved, the material spreads more evenly, road costs go down, better roads are built to last longer with reduced maintenance.

There's no time like the present to find out how Etnyres can save you money with their dependable, accurate, economical operation. See your Etnyre dealer for specifications and prices, or write E. D. Etnyre & Co., Oregon, Illinois, U.S.A.

SEE YOUR ETNYRE DEALER

ETNYRE

"Black-Topper"

BITUMINOUS DISTRIBUTORS

. . . for more details circle 181, page 16

Oil Men Told Asphalt Is "Silent Salesman"

THE oil industry meeting at San Antonio March 29 was urged to join in the aggressive promotion of petroleum asphalt for highway paving. Oilmen attending the 45th annual meeting of the Western Petroleum Refiners Association heard J. E. Buchanan, president of The Asphalt Institute at College Park, Md., plead for greater industry support of its "Cinderella" product.

"Any product that can expand our highway network faster and more economically deserves your serious concern," Buchanan told the refiners. "When that product is, in every sense of the word, your product — it becomes a matter of industrial life and death to you." The head of the asphalt industry's engineering and research center called asphalt "the Cinderella . . . petroleum product with the greatest unrealized potential." It is the one petroleum product that is the great silent salesman of gasoline and lubricating oil," he declared.

The Institute president cited figures to show that the national population is expanding at the fantastic rate of "one full-sized town" per day. "Last year our net gain was 2,823,000 people," he said. "This represents one new full-sized American town of 7,750 persons every morning. . . ."

Unless this mushrooming population can be accommodated with thousands of additional miles of paved highways, he pointed out, traffic congestion will reach such discouraging proportions that motor travel will cease to have any allure. On the other hand, Buchanan predicted today's vehicle count of 58,000,000 could reach the expected 80 to 85 million by 1970, only if our roads and streets are expanded to handle the flow.

Better paved roads are needed to keep American wheels moving and to provide the petroleum industry with the expanding market it must have. "This is a matter of very real concern to all segments of the oil industry," he added, "not alone to those refiners who happen to make asphalt."

He said the failure of the oil industry to grasp this "salient" point "is a source of never-ending surprise to those of us at The Asphalt Institute; surprise and dismay."

The Institute leader called for the help of the oil industry in what he described as "a rough-and-tumble" competitive battle for preferential place in any future highway expansion program. He urged that this assistance might be offered in the form of cooperative advertising and use of routine company mailings to sell the asphalt story.

Pennsylvania launches worker safety program

An intensive campaign to reduce accidents involving state highway workers has been started by the new administration in the Pennsylvania Department of Highways. This emphasis marks the continuation of safety effort that has brought marked results in this state.

During 1954 eight highway workers were killed, six being involved in accidents directly connected with their duties, while two were killed by passing vehicles.

An analysis shows that in most instances the employee either ignored fundamental safety rules, or was not properly instructed to exercise caution in handling his job, said a department spokesman.

How to get more mileage out of your road appropriations . . .

THE problem of providing the best possible roads within the confining limits of the yearly budget can be most successfully met by using Tarmac®, a quality road tar manufactured by Koppers Company.

Here's why:

First, Tarmac is easy to apply, speeds construction operations. It quickly penetrates to coat aggregates thoroughly, even through films of moisture and dust. The strong adhesive quality of Tarmac assures highest binding power on stone, gravel or other aggregates.

Second, a Tarmac road will give exceptionally long life with very low maintenance costs. Tarmac effectively resists the harmful stripping action of water, the deteriorating effects of oxidation and the dissolving effects of gasoline and oil.

Repair costs can be kept way down with Tarmac because it is self-healing . . . small cracks heal themselves under the action of traffic.

Finally, a Tarmac road is a safe road—even in wet weather. Since Tarmac penetrates so well, it leaves the traction surface of the aggregate exposed. Tarmac does not form a skiddy surface film when it rains.

These outstanding Tarmac features make it ideal for almost any type of road: secondary highways, feeder roads, rural roads, city boulevards, bridge surfaces—and for parking lots and airport runways. Write for further information today.

KOPPERS COMPANY, INC., Tar Products Division, Dept. 532-T, Pittsburgh 19, Pennsylvania

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, WOODWARD, ALA.

KOPPERS Tarmac® MAKES BETTER ROADS

. . . for more details circle 257, page 16

What's New
in Equipment and Materials

Reader Service Coupon on Page 16, more items pages 138-151

Improved Maintenance Distributor

The Grace Rapidspray maintenance distributor is now offered with a circulating spraybar as extra equipment. This distributor is made in 600 and 800 gal. sizes, for trailer or truck mounting, and in spraybar widths up to 12 ft. Optional equipment includes burners for bottled gas (propane) instead of the usual kerosene burners. A triple valve on the pump intake is also extra equipment, and permits pumping asphalt from bottom of the tank, or at levels 12 and 24 in. from the bottom. Models 221 and 231

Grace Rapidspray Maintenance Distributor

T have VE4 Wisconsin 17¾ HP engines and 100 GPM Viking pumps. Detailed literature may be obtained from W. E. Grace Mfg. Co., 6007 Lamar St., Dallas, Tex.

For more information circle 131 on Service Coupon Page 16 and mail now.

"Night-Shine" Lettering for Contractor or Traffic Signs

Your name, a message, or a warning that will look good by day and shine brilliantly under lights at night, can be neatly spelled out with Night-Shine plastic letters and numerals. Available at Jerry Scanlon, Inc., 1901 Clybourn St., Chicago 14, Illinois.

The letters are adhesive backed for removable or permanent adhesion to metal, glass, wood, leather. Reflective glass beading is sealed in a coat of plastic for protection against water and weather. Square-sided letters line up with uniform perfection, enabling any amateur to put up a sign or message that will have a trim, professional look. Special messages or designs made up to order. Can be peeled off and reused; will retain brilliance for many months. Sizes 2 in. or 3¾ in. high. Cost only a few cents per character, respectively lower in quantities. Very large letters also available. Write above firm for details.

Night-Shine Letters

For more information circle 132 on Service Coupon Page 16 and mail now.

Side Form Vibrator Attachment

A new Hi-lectric side form vibrator attachment has been announced by the Maginnis Power Tool Co., Mansfield, O. The new lightweight unit is designed for mounting directly on 12 or 24 ft. Jaeger or Blaw Knox concrete spreader and 12 or 24 ft. Jaeger, Blaw Knox or Heltzel finishers. It is also adaptable to telescoping type finishers. Vibrators can be mounted as much as 15 in. in from the side forms and still vibrate concrete effectively at the forms. The attachment consists of 2 Maginniss Hi-lectric motor-in-head concrete vibrators, spring mounted on a shaft and hanger assembly. Side form vibration is supplied by 2 Maginniss Hi-lectric motor-in-head concrete vibrators. Each vibrator head contains a 120 volt, 180 cycle squirrel cage induction motor, direct-connected to an eccentric weight capable of delivering up to 10,500 vibrations per

BROS *tip sheet* **EXTRA**

50 HP, TORQUE CONVERTER DRIVE, FULL OSCILLATION FEATURED IN NEW BROS SELF-PROPELLED ROLLER

MAT RESURFACING, SEAL COAT JOBS AND SHALLOW LIFT COMPACTION... DONE SMOOTH AND FAST BY BROS SP-54!

Minneapolis, Minn. "This sonuvagun is just what I've been looking for in a pneumatic tire roller!"

... That's the standard reaction from the many road contractors who've gone over the new BROS self-propelled 5 x 4 pneumatic tire roller with a fine tooth comb.

Backed by special design and exhaustive testing, the SP-54 is unquestionably the nigh perfect machine for mat resurfacing, seal coating and compaction jobs in the shallow lift range. And it's easy to see why:

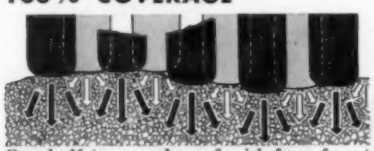
Torque converter drive, 3-speed transmission and shuttle gear provide the smooth, high maneuverability needed for the exacting compaction results being specified these days. Combined with the 50 hp engine, you've got a smooth flow of real power at 0 to 18 mph speeds — both forward and reverse.

Shuttle speed feature of this new roller saves time by eliminating turn-around on short road beds. It eliminates the bugaboo of tipping over chips frequently done by tow tractors — in fact, it saves cost of tractor, too!

FULL OSCILLATION

Here, take a look at the full oscillation of all wheel pairs on the SP-54. This feature is engineered into the front wheel pairs as well as the rear for even load distribution for uniform compaction densities... 2,000 lbs. per wheel or 265 lbs. per lineal in. of rolling width.

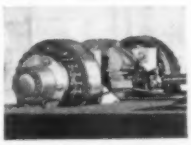
100% COVERAGE



One-half in. overlap of wideface front and rear tires provide solid coverage over entire surface. Drawing shows overlap and the flow of compaction exerted to knead out surface voids. On seal coating, this BROS "first" correctly imbeds sand without any grinding or crushing action.

... for more details circle 259, page 16

POSITIVE CHAIN DRIVE



Tractive effort is maximized by positive chain drive to *all* rear wheels. Dual chain drives smoothly transmit drive power so there's no wheel spinning or tearing up seal coat surface.

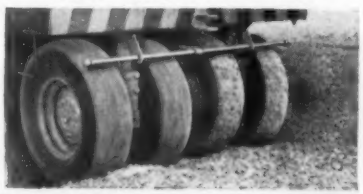
FORE AND AFT VISIBILITY

In both forward and reverse, the operator sees and knows exactly where he's at... another example of how steady, uniform compaction work is inherent in the SP-54's design. Note easy accessibility of shut-off valves under operator's seat for optional front and rear water sprinkler bars.

EASY HANDLING BY HYDRAULIC STEERING

UNIFORM hydraulic steering of the SP-54 gives you sure, smooth control at all engine and roller operating speeds. High turning angle for easy turn around.

DOUBLE BRAKING, NO "DEAD WHEEL" IN REAR



Hydraulic brakes on both rear wheel pairs can be operated simultaneously or separately — as you see here. Loss of tractive effort on one wheel pair is quickly corrected by braking it; this transfers needed drive power to other pair. As is obvious, there's no "dead" wheel to get unit "hung up" on extreme surface contours.

18 FOOT TURN AROUND

Turning radius of the SP-54 is 18 ft., 5 in.; faster job completion because there's no lost motion — busy from morn til night. The SP-54 is built by BROS, the world's largest manufacturer of pneumatic tire compaction equipment.

So get in on lower compaction costs and the best results possible — *right now.* For complete information, write: The Wm. Bros Boiler & Mfg. Co., 1057 Tenth Avenue S.E., Minneapolis 14, Minnesota.

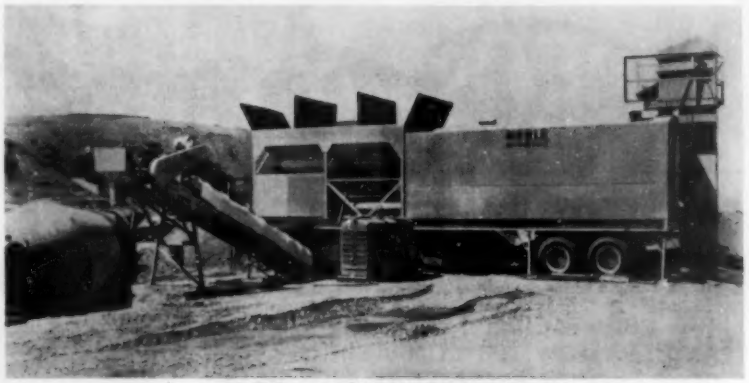
minute. A Maginniss Model HGG-4B 3 KW Hi-lectric gasoline engine-driven generator, resiliently mounted on the platform of the spreader, supplies current to power the vibrators, as well as flood-lights and maintenance tools when needed. Vibration frequency can be varied by adjusting engine speed.

Maginnis Hi-lectric Side Form Vibration Attachment Mounted on Jaeger Spreader in Use on Ohio Turnpike Sections C-2 and 3

For more information circle 133 on Service Coupon Page 16 and mail now.

Mobile Batching Plant

A completely self-contained mobile batching plant has been developed by the Fruehauf Trailer Co.'s Oakland, Calif. branch in connection with the Noble Co., Oakland, Calif. It is stated the plant will produce approximately 500 cu. yd. of mix in an 8-hour day and it is claimed will reduce the cost of pouring by better than one-third. This reduction is claimed to be made possible by the fact that the unit can be moved to close proximity of the jobs with the result that transit-mix trucks are necessarily reduced in number. The unit illustrated is completely self-sufficient. It has its own cement storage, its own motor generator to provide power and can be supplied from a water tank as necessary.



Self-Contained Mobile Batching Plant

For more information circle 134 on Service Coupon Page 16 and mail now.

128 New Models Added to GMC Truck Line

A complete line of 128 new 1955 GMC truck models, featuring units powered by V-8 engines, a new concept in streamlined design and some 500 major styling and engineering improvements, has been announced by GMC Truck and Coach Division, Pontiac, Mich. The new models will be called GMC's "Blue Chip" truck. More than doubling the number of models offered in 1954, the new line brings 74 entirely new models into the GMC family of light, medium and heavy-duty vehicles. Other highlights include a new series of lighter weight diesel trucks, expanded use of Hydra-Matic transmissions.

Two different V-8s have been developed. The 288 cu. in. engine for light and medium-duty trucks develops 155 HP and the 324 engine for medium and heavy-duty vehicles achieves 175 HP. All of GMC's 6-cylinder gasoline engines have been increased in power. The horsepower of the 248 engine has been raised from 125 to 130, the 270 engine from 137 to 140, the 302 engine from 145 to 155, the 360 engine from 155 to

"Blue Chip" Model

170, the 426 engine from 177 to 190, and the 503 engine from 200 to 225. The number of models equipped with Hydra-Matic transmission has been boosted from 13 in 1954 to 65 in 1955.

For more information circle 135 on Service Coupon Page 16 and mail now.

Batch Type Bituminous Mixing Plant

A new batch type bituminous mixing plant, the H-15, announced by Iowa Manufacturing Co. Cedar Rapids, Ia., has a capacity range of 35 to 60 tons per hour, depending upon job specifications. The pugmill mixer has a capacity of 15 cu. ft. (net below center line of shafts).

The H-15 is a stack-up, tower-type plant consisting of a hot elevator, screen and bin section, batcher and mixer section, bitumen pump, jacketed bitumen piping and valve, stairway, platform, controls and drives. The plant is extremely easy to erect since the sections are self-contained units. After the base is set up, the batcher and mixer section with aggregate and bitumen scales and batchers connected is hoisted into position. Screen and bin section is then hoisted on top of the batcher-mixer section. Hot elevator raised into position and piping connected.

The H-15 is offered as a portable or stationary plant with a choice of combustion engine or electric motor drive. All gates and valves are operated manually through mechanical linkage, except mixer discharge gate which has a manually controlled hydraulic cylinder. Optional equipment includes portable equipment, mineral filler attachment and electric timing and locking device. To make a complete bituminous mixing plant, add a Model 4816-P packaged drier unit or 6024 Drier, drier feeder unit and dust collector.

Model H-15 Bituminous Mixing Plant

For more information circle 136 on Service Coupon Page 16 and mail now.

Manufacturers' Literature

40 Models Portable Air Compressors

A new 12-page catalog issued by Le Roi Division of Westinghouse Air Brake pictures all of the company's 40 models of portable type compressors. The quick reference chart easily shows the contractor the capacities, engine types, and mountings available. The bulletin also illustrates the exclusive Airmaster features such as: Replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines, and magneto ignition on all gasoline models. Captions provide a quick explanation for the reader in less than two minutes. Copies of this new piece of literature, CG-9A, can be obtained by writing to: Sales Promotion Department, Le Roi Division, Westinghouse Air Brake Co., 1706 South 68 St., Milwaukee 14, Wis.

For more information circle 137 on Service Coupon Page 16 and mail now.

Hyster Hystaway Excavator-Crane

A new informative 20-page brochure (Form No. 1235) describing the Hyster Hystaway excavator-crane mounted on new or used Caterpillar D6, D7 or D8 track-type tractors is available from Hyster Co., 2902 N. E. Clackamas, Portland 8, Oregon. The well illustrated booklet explains on-the-job advantages of the Caterpillar-built tractor with dozer blade and Hystaway which can be quickly converted to either shovel, backhoe, dragline, crane, clamshell or pile driver. In-operation features of the Hystaway for full track-type mobility and maneuverability are pointed out. Specifications of each Hystaway job attachment are given. Also described is its versatility in permitting tractor bulldozing without the requirement of removing the Hystaway.

For more information circle 138 on Service Coupon Page 16 and mail now.

Automatic Hydraulic Control for Mixer Chutes

A 4-page circular is available from Monarch Road Machinery Co., Hydraulic Division, 1331 Michigan St., N.E., Grand Rapids 6, Mich., illustrating and describing its Dyna-chute kit for raising and lowering the chutes of transit or ready mix concrete mixers. The unit will raise a ton or more even when the mix is running. It holds automatically when the control valve is in neutral and will not lower or raise until the driver switches the handle.

For more information circle 139 on Service Coupon Page 16 and mail now.

Prepakt Concrete Intrusion Grout

A 32-page brochure on prepakt concrete intrusion grout describing its composition, special properties and applications is available from The Prepakt Concrete Co., Division of Intrusion-Prepakt, Inc., Union Commerce Bldg., Cleveland 14, O. An 8-page brochure describing how the prepakt method is being used in the construction of the substructure for the 5-mile Mackinac bridge is available.

For more information circle 140 on Service Coupon Page 16 and mail now.

Truck Body and Hoist Equipment

A new 4-page illustrated bulletin, BH-54120, issued by The Heil Co., Milwaukee 1, Wis., covers the entire line of Heil truck equipment. Featured are Heil dump bodies and twin arm hoists, lightweight telescopic hoists and dump bodies designed exclusively for them, conversion hoists, rock bodies, Colectomatic sanitary refuse units, Colecto-Pak garbage bodies and Heiloader hydraulic elevating truck tailgates. Photographs, specifications and descriptive copy fully cover each of the units. One full page of pictures features action photos of Heil equipment at actual job locations.

For more information circle 141 on Service Coupon Page 16 and mail now.

Power Hydraulics Controls for Snow Plows

A circular on its Dyna-Might electric power hydraulic control for snow plows is available from Monarch Road Machinery Co., 327 Front Ave., N.W., Grand Rapids 4, Mich. Dyna-Might is a simple, compact (storage battery powered) electric hydraulic power control that actuates snow plows automatically. Dyna-Might develops 1500 lb. per square inch pressure. Either the HEP package self-contained unit or the standard HE model is one-man, cab-controlled.

For more information circle 142 on Service Coupon Page 16 and mail now.

Wire and Cable for Street Lighting

A new book (Publication No. 19-294) on street lighting cables, announced by General Electric's Wire and Cable Department, Bridgeport 2, Conn., is designed to help municipalities, public utilities, highway planning commissions, and engineering consultants select the type of cable best suited to a particular installation. Both series and multiple street lighting circuits are discussed. Complete specification data are given on general types of cables for direct burial, and for use in conduit, duct or open-air as well as for cables for overhead lines to luminaires and from pole bases to luminaires. Splicing and terminating methods for cables with various types of insulation are also included.

For more information circle 143 on Service Coupon Page 16 and mail now.

New Welding Process

The performance and applications of new consumable electrode inert gas welding process — West-ing-arc — are given in a new booklet (B6525) available from the Westinghouse Electric Corporation, P.O. Box 2029, Pittsburgh 30, Pa. This 7-page booklet answers the questions: What is West-ing-arc? What can it do? Where can it be used? What are the operating costs? What are the components? Descriptions of fillet, lap, butt, and plug welds made with the new process are accompanied by actual photos. Weld cross sections are also shown. The booklet points out how the arc stability of the new process effects operating costs in terms of gas consumption, and time required for cleaning.

For more information circle 144 on Service Coupon Page 16 and mail now.

Traffic and Warning Signs

The new 1955 Lyle sign catalog (B-55) showing the most recent U. S. Standard signs and specifications is available from Lyle Signs, Inc., 2731 University Ave., S.E., Minneapolis 14, Minn. It contains 40 pages of information and illustrations on all types of traffic, warning and safety signs, posts, brackets.

For more information circle 145 on Service Coupon Page 16 and mail now.

Nickel-Copper Steels in Bridge Construction

A new 48-page booklet illustrating the wide application of nickel-copper high strength low alloy steels in bridge construction, transportation, mining, marine equipment, agriculture and other fields, is available from The International Nickel Co., Inc., 67 Wall St., New York 5, N.Y. Working methods, mechanical properties, compositions and availability of seven steels of this class are given.

For more information circle 146 on Service Coupon Page 16 and mail now.

Tractor-Mounted Excavator

A new booklet describing the Sherman Power Digger is offered by Sherman Products, Inc., 3400 West 14 Mile, Royal Oak, Mich. The booklet contains illustrations and explanations of the wide range of uses for the Sherman digger, and actual on-the-job picture. Accessories, work range and specifications of the machine are also covered.

For more information circle 147 on Service Coupon Page 16 and mail now.

Torque Converters

An 8-page, 4-color catalog describing its line of Torcon torque converters is available from Clark Equipment Co., Transmission Division, Falshee Road, Jackson, Mich. Extensively illustrated, the brochure depicts models, shows attachments for specific adaptations, and describes, with cutaway drawings, construction of the converters.

For more information circle 148 on Service Coupon Page 16 and mail now.

Bullgrader and Bulldozer Blades

International hydraulic bullgrader and bulldozer blades matched to International T-6, TD-6, T-9, TD-9, TD-14A and TD-18A crawlers are described in a 24-page catalog just published by International Harvester Company. The bulldozer blade assembly is solid welded without pin connections, providing a rigid, level blade. The bullgrader blade, connected by pins to the main frame, may be horizontally angled or vertically tilted. Full specifications of the International hydraulic bullgrader and bulldozer blades, and pictures of them on the job, are contained in the new catalog. It may be obtained by writing to Consumer Relations Department, International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

For more information circle 149 on Service Coupon Page 16 and mail now.

Wayne Full ¾ Yd. Crane-Excavator

Thoroughly descriptive bulletins combining complete descriptions and specifications of the Wayne full ¾ yd. crane-excavator have been released by the Wayne Shovel and Crane Division of the American Steel Dredge Co., Inc., Fort Wayne, Ind. In addition to specifications and lifting capacities, Bulletin No. 424 describes all the features of the Model 70 crawler-mounted Wayne machine. Wayne's exclusive new design — a custom-made crane-excavator at production-line cost — is completely explained. Bulletin No. 425 contains all the specifications, lifting capacities and overall dimensions of the 50A and 50B truck-mounted Wayne models.

For more information circle 150 on Service Coupon Page 16 and mail now.

Highway Mowing

A new, informative booklet titled "What is Happening to Highway Mowing" has been issued by the Triumph Machinery Co., Hackettstown, N.J., manufacturers of the Hydro-Clipper. The booklet, written by experts in the highway mowing field, discusses the problems presented to state,

county, city and town officials by modern traffic conditions and possible solutions to increase mowing efficiency while lowering costs.

For more information circle 151 on Service Coupon Page 16 and mail now.

Contractors' Portable Self-Priming Centrifugal Pumps

A new bulletin (No. 1230-B1) on contractors' portable self-priming centrifugal pumps issued by Worthington Corporation, Advertising and Sales Promotions Dept., Harrison, N.J., offers information on details of construction, specifications and component parts. Rating charts are included showing performance requirements under average job conditions for each size pump. All rating and capacity figures are listed in conformance with standards set forth by the Associated General Contractors of America, Inc. Two tables list pumping unit and engine data for the various models. Specifications for Worthington's frame-mounted, self-priming centrifugal pumps are also provided along with an outline drawing showing a typical section of the pump.

For more information circle 152 on Service Coupon Page 16 and mail now.

Tandem Rollers, 5-14 Ton Models

A new 16-page bulletin on its tandem roller line has been announced by Huber-Warco Co., Marion, O. Bulletin in HWT-501 features color photos of Huber-Warco tandems in action and describes in detail the company's 5-8, 8-10, 8-12, and 10-14 ton models. With cross-sections, diagrams and photos the bulletin points out features of the frame, gear train, guide roll assembly, fluid coupling, clutches, dual controls, accessibility for servicing, ventilation, two independent braking systems, and close curb clearance. A special section lists the road machinery background of both companies which now make up Huber-Warco. This brief historical digest tells of the achievements of both Huber and Warco since the early days of road machinery development. On the back cover is the complete Huber-Warco line of tandem rollers, 3-wheel rollers, and graders.

For more information circle 153 on Service Coupon Page 16 and mail now.

Bitumuls Base Construction

"Bitumuls For Base Construction" is the title of a new 12-page, two-color booklet discussing the use of Bitumuls emulsified asphalt and the advantages it provides in this phase of pavement construction. Beginning with a description of Bitumuls, it follows step by step the preparation and placement of Bitumuls mixes.

The bulletin stresses the ability of Bitumuls to mix with and actually improve the quality of readily available, or even "in-place" native aggregate. Bitumuls mixing grade emulsified asphalt readily coats non-cohesive materials. This factor coupled with Bitumuls' world-wide distribution places no geographical limits on its application. Fast and efficient mixing, generally without the necessity of heating, results in real savings in time, manpower and equipment, according to the bulletin. Delays due to inclement weather are also reduced since Bitumuls is compatible with moisture.

Data and photographs covering typical Bitumuls road bases are included in this booklet as proof of performance. These include Alaskan Airports; Lakehurst, N. J., Naval Air Station; Lakeside Drive, Oakland, Calif; and miles of city streets, county roads, highways, parking lots and other paved areas.

The text is illustrated with charts and photographs detailing various construction methods and the equipment used in each. The booklet is available from American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 4, Calif.

For more information circle 154 on Service Coupon Page 16 and mail now.

Fuel Injection Equipment

"Six Money Saving Facts About Caterpillar Fuel Injection Equipment," a new booklet (Form No. DE580) published by Caterpillar Tractor Co., Peoria, Ill. explains what's behind the production and design of efficient fuel injection equipment. Among the features discussed in the new booklet are interchangeability of parts, ease of maintenance, adjustment free design, and the ability to burn non-premium fuels.

For more information circle 155 on Service Coupon Page 16 and mail now.

Vibrators, Grinders, Rotary Trowels, Screeds

A new 16-page illustrated Catalog, No. 552, published by Stow Manufacturing Co., 65 Shear St., Binghamton, N. Y., shows their complete line of concrete equipment. Complete data are given on their universal electric and gasoline concrete vibrators, portable concrete grinders, gasoline and electric rotary trowels, and concrete vibrating screeds. The many new features on the G34 model (34 in. diameter) Roto-Trowel are discussed in detail. For the benefit of the contractor who wants to build his own screed using the Stow screed package assembly, complete directions on "How To Build Your Own Pre-Stressed Screed Beam" including a drawing, are printed on the back page of this catalog.

For more information circle 156 on Service Coupon Page 16 and mail now.

Service Manual for ATC Tractors

A new service manual (AM-55) on factory approved tools for maintenance service on ATC Terratrac tractors is available from the Owatonna Tool Co., 435 North Cedar St., Owatonna, Minn. The new bulletin is extensively illustrated with action photos showing both OTC manually operated and hydraulic equipment in action removing and installing gears, bearings, and sprockets as well as performing other approved maintenance jobs on American Tractor Equipment. In addition the manual contains illustrations and listings of the complete components for several new manual and hydraulic tool sets that OTC has developed to handle the various service jobs illustrated.

For more information circle 157 on Service Coupon Page 16 and mail now.

Crushing Plant Combines Mobility and Low Cost Operation

The mobility of Cedarapids portable design and the high capacity and low-cost operation of Nordberg-built Symons cone crusher are featured in a bulletin issued by Iowa Manufacturing Co., Cedar Rapids, Ia., on its new Cedarapids-Symons cone crusher plant. The Cedarapids is easy to take down or set up. Use of horizontal vibrating screen permits lower over-all height. It has a low maintenance cost. In the Symons cone crusher controlled feed combined with high impact velocity and wide throw of the crushing head permits rapid flow of material and high ratio of reduction in crushing cavity.

For more information circle 158 on Service Coupon Page 16 and mail now.

Soil Stabilization with Salt

A bulletin entitled, "Better Highways through Salt Soil Stabilization," available from International Salt Co., Inc., Industrial Division, Scranton 2, Pa., is filled with practical on-the-job information for roadmen. In addition it describes how highway soil properly stabilized with sterling rock salt resists both excessive moisture and extreme dryness.

For more information circle 159 on Service Coupon Page 16 and mail now.

Let SEALZ help you save on all paving costs

Naugatuck Chemical's specially developed SEALZ rubber compounds for roads and runways can help give you pavements that *last longer*, require *less maintenance*, and *are easy and economical to apply.*

Surfa-SEALZ—a synthetic rubber additive for bituminous concrete *now in handy pellet form*—gives a strong, elastic bond of asphalt to aggregate that greatly reduces flushing—keeps pavement tough and flexible through all kinds of weather.

Its handy pellet form allows it to be shipped anywhere, stored indefinitely. Extremely quick dispersing, it requires no special equipment. *And it adds little to the initial costs and reduces maintenance costs.*

Joint-SEALZ—a hot-poured *joint sealer* for concrete pavements—forms a tight, lasting bond that won't extrude in the hottest weather, won't crack, or pull away in the coldest.

Aero-SEALZ—a jet-fuel-resistant joint sealer for concrete *airport* surfacing—resists damage from fuel spillage, petroleum distillates, and engine cleaning compounds—gives longer trouble-free *ramp* and *runway* life.

Surfa-Aero-SEALZ—jet-fuel-resistant pavement binder for airport *surfacing*—gives airfield pavements outstanding resistance to fuels, oils, and solvents.

Let science help solve your surfacing and sealing problems. Write for more information on SEALZ® compounds today.

Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N.Y.

. . . for more details circle 252, page 16

FOR SALE

6000, 9:00 x 20 Army combat tires, tubes & wheels, $20 each; 100, 11:00 x 18 tires, tubes and wheels, $25 each; 50 bbls. Deoxidine #624, 50 cents per gallon in barrel lots; 50 bbls. Enamel thinner, 75 cents per gallon; #1 Permatex, $1.25 per gallon; 2000 new 14MM Firestone F40 spark plugs, 20 cents each in lots of 50.

RECONDITIONED

6x6 G.M.C. trucks	$1500.00
6x6 Dodge, 1½ ton trucks	695.00
6x6 Reo, 7½ ton trucks	2500.00
6x6 Biederman, 7½ ton trucks	2500.00
4x4 Chev. cargo with body & winch	750.00
4x4 Chev. Bomb carriers, AS IS	350.00
4x4 Chev. tractors	550.00
4x4 Autocar, 5 ton trucks	1000.00
4x4 Federal, 5 ton trucks	1000.00
4x2 Chev. & Ford 1½ ton cab & chassis	350.00
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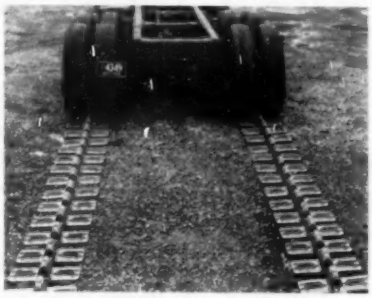

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10:00 x 20	$264.00	$456.00	$456.00	$456.00	$480.00	$480.00	$480.00	$504.00	$504.00
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⅜ to 4 yd. dragline buckets.
⅝ to 1½ yd. clamshell buckets.
½ to 2 yd. concrete buckets.

STEAM GENERATOR
Littleford Model 3500.

FINISHING MACHINES — Asphalt
Barber-Greene S/H 879-4-72.

PUMPS
1½" to 6" centrifugal.
4" jet Gorman-Rupp.
6" jet Peerless 3-stage.
3" to 4" Diaphram.

HOISTS
Clyde & American, 1, 2 & 3 drum.

AIR TOOLS
Wagon drills, jack hammers, air hoists, tampers, paving breakers, riveting tools, wood-borers, impact wrenches, concrete vibrators.

SAWS
20" band, Skil, radial, DeWalt, table, Skil—hand, C-P (air), chain.
Wright (air) chain.

MISCELLANEOUS
Pneumatic Rollers.
Jeep Ditcher.
Williams Auger, 20 ft. truck mounted.
Sullivan Shalesaw.
Sullivan Wagon Drill.

TEXAS CONSTRUCTION CO.
1201 Main St. Dallas, Texas
Phone AD5-7134 E. R. Funk

CONSTRUCTION EQUIPMENT BARGAINS

1 10-Ton wood stiffleg derrick with steel boom, three drum Lidgerwood Hoist and Boiler (Location Minneapolis).

1 20-Ton Mod. MC 414 Lorraine Truck Crane 70' boom (Location Minneapolis Area).

1 24" x 60'-0" Conveyor mounted on Rubber — Gasoline Engine Power (Location Minneapolis).

1 1182 McKiernan-Terry Steam Pile Hammer with steel leads, followers for wood, steel and concrete piling (Location Florida).

1 27E Rex Paver (Location Minneapolis).

1 27-E2A Koehring Paver (Location Boston, Ohio).

4 Garbo Power Concrete Buggies (Location Minneapolis).

1 Heltzal combination cement and aggregate plant, with three 37 ton aggregate compartments, 162 barrel daily use bin for cement and 375 barrel cement storage bin. Plant full automatic with latest recording equipment. Purchased new in April, 1954 used on one job for 6000 cubic yards of concrete. Further details on request. (Location Boston, Ohio) Price as is where is:

1 117 foot concrete tower with necessary equipment for hoisting 1 cubic yard of concrete and thirty foot material boom (No Hoist) (Location Boston, Ohio).

1 27-C.F. Electric Air Compressor.

1 40-Ton Browning Locomotive Crane Steam power good condition (Location Minneapolis Area).

1 Concrete hopper on Pneumatic Tires. Capacity three cubic yards (Location Minneapolis).

1 ⅜ cubic yard Kiesler Clamshell Bucket (Location Minneapolis).

C. R. Sundboom
2288 University Avenue
Phone: Midway 9680
St. Paul 4, Minnesota

FOR SALE

D-13000
CATERPILLAR DIESELS
Direct-Connected to
75KW 92.5KVA, 110/220/440 VOLT AC
LOUIS ALLIS AC GENERATOR
COMPLETE WITH CONTROL PANEL
SKID MOUNTED
FUEL TANKS BUILT IN BASE

D-8800
CATERPILLAR DIESELS
Direct-Connected to
50KW, 62.5KVA 110/220/440 VOLT AC
LOUIS ALLIS AC GENERATOR
COMPLETE WITH CONTROL PANEL
SKID MOUNTED
FUEL TANKS BUILT IN BASE

Additional Gas and Diesel Units in Stock

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SOUTHWESTERN SUPPLY & EQUIPMENT CO.
PHONE Mission 9-2706 — P.O. Box 14357 — 7225 CHOCOLATE BAYOU
HOUSTON 21, TEXAS

FOR SALE — Surplus Equipment

Manitowoc 2000B Comb. Crane, Shovel & Dragline, Independent Boom Hoist, 65 ft. Boom, Jib, Caterpillar D13000 Powered. In excellent condition throughout.	
1950 Allis Chalmers HD19 w/A. Dozer	$7,500
Buckeye Model 32 Ditcher, wheel type	1,250
Lorain L41 Backhoe Attachment	1,750
Blaw Knox G.P. 1½ yd. Clam Bucket	1,000
Owens 2½ yd. Clamshell Bucket	1,500
Sullivan 365, Cat Diesel Compressor	3,000
Athey 18 yd. Crawler Wagons, each	1,350
40 Ft. Boom, Lorain 80 or 82	500
6 Caterpillar D8 Pusher Blocks, each	75

R. B. POTASHNICK
GENERAL CONTRACTOR
P.O. Box 423 — Phone 5-8204
CAPE GIRARDEAU, MISSOURI

SALE OR RENT:
½ yd. Lorain Crane — Excellent Condition.
¾ yd. Lorain Crane — Excellent Condition.
Digging — Rehandling — Concrete Buckets.
10-S Mixers, Vibrator, 2"-3" Pumps.
Compressor — Air Tools — Gravity Hammer — 40' Leads, Form Ties, Curb & Gutter Steel Forms.

T. J. VITCENDA
Lake Mills, Wis.

FOR SALE

4 Ransome 3 yd. transit mixers, mounted on Mack trucks. Excellent condition.
Three compartment bins, seventy-five ton, with scales.
Northwest 25 crane-drag., Cat. diesel, perfect condition.
Osgood 200 Hoe & Drag., practically new.
Link-Belt LS-52, ¾ yd. crane, 50' boom like new.
Bantam, on GMC 6x6 Crane.
Quickway, on GMC 6x6, Hoe & Drag.
Scoopmobile with bucket and ladder.
D-2, Cat., 50" gauge hydraulic blade, model 5W, 1200 hrs.
3000' - 6" forms.
Vibrators, pumps, generators, air tools, compressors and dump trucks.
New 1 yd 28S Smith non-tilt mixer with water tank complete.

All located our yard, priced to sell.

S. E. GILL
P. O. Box 67, Station E, Atlanta, Ga.
Phone: Dearborne 0532

TRUCKS — TRAILERS

1951 White WC2264 Tandem Tractor.
1951 Mack LFT Tandem Tractor.
1945 Federal 7½ ton 6x6 Tandem with GarWood Swing Crane and Light Plant.
1945 GMC 6x6 Tandem Cargo.
1948 (2) Ford F8 — Hercules Rock Dump Bodies.
1949 (5) International KBS10 — 5 yard Dumps.
1950 Ford F-7 with W45 Holmes Wrecker.
1951 International L185 Tractor—Air Brakes.
1949 Dodge 4x4 Power Wagon.
1949 LaCrosse Tandem Lowboy Trailer.
1950 Gramm 30 foot Aluminum Van Trailer.

MANY MORE TO CHOOSE FROM
½ to 10 TON TRUCKS

BILL FISHEL
Vandeventer Auto Sales
717 SO. VANDEVENTER
PHONE: FRANKLIN 11750
ST. LOUIS, 10, MISSOURI

PRE-SPRING SPECIALS OF "USED MACHINERY"

(For Sale or Rent with or without purchase option)

(1)	GARDNER-DENVER Model WBK-500, 500 cu. ft. Portable Air Compressor — A-1 Condition — Caterpillar Diesel power on four pneumatic Tired Trailer No. 142956 — f.o.b. Omaha, Nebraska	$ 5,750.00
(1)	KOEHRING Model 301 Combination Dragline-Clamshell 50' Boom — $750.00 approx. in new Engine and Crane parts, Wisconsin gas power — in working condition — f.o.b. Omaha, Nebraska	3,100.00
(2)	4 cu. yd. Dumpcretes — Model 4C — These units are complete and in very excellent condition — f.o.b. Omaha, Nebraska. Each	650.00
(1)	Model KX-16 — 9-14 Ton BUFFALO-SPRINGFIELD 3 Axle Tandem Roll — A-1 Condition — Serial No. 22712 — f.o.b. Rapid City, So. Dakota	5,500.00
(1)	ROSCO — 1500 gallon Pressure Distributor — Working Condition — Semi-Trailer mounted — f.o.b. Grand Island, Nebraska	750.00
(1)	Shovel attachment for 205 KOEHRING Model 205 — 1A, attachment No. C4908-4131 — Like New — Used on One Dirt Job — f.o.b. Omaha, Nebraska	950.00
(1)	BARBER-GREENE Model 848 Travel Plant Mixer No. 48-1-11 powered with 6DC844 Buda Diesel — Machine Reconditioned and in First Class Condition — f.o.b. Omaha, Nebraska	11,000.00
(1)	SARGENT Combination Dragline-Clamshell Model 34 No. 155 — Good Working Condition — Caterpillar Diesel Engine. f.o.b. Algona, Iowa	6,750.00
(4)	REX 3 yd. Moto Mixers 4¼ cu. yd. Agitators — Machines in good working Condition — f.o.b. Omaha, Nebraska. Each	1,750.00

All quoted subject Prior Sale.

Also available are Air Compressor, Hoists, Air Tools and other miscellaneous equipment.

WRITE — PHONE — WIRE

Fuchs-Clayton Machinery Company

901 South 40 Street — Phone: HA-8733

OMAHA, NEBRASKA

FOR SALE

CATERPILLAR D-4 S/N 7U7970 w/ Athey overhead loader. Fair..**$1,500**

HOUGH HA "Payloader" S/N 22447, ½ yd. Good.....**$1,500**

SCOOPMOBILE B Loader S/N PS2789, 1 yd. Very Good.....**$1,250**

HOUGH HAH "Payloader" S/N 51620, ⅔ yard, 7 foot Dump Clearance. Good **$2,000**

HOUGH HL ¾ yd. "Payloader" S/N 15526. Condition Excellent ...**$2,500**

PARSONS 221 Trencher S/N 1926, 24" and 36" Buckets, over $500 spare parts. Good **$5,500**

All prices quoted F.O.B. St. Louis.

WANTED

CT-9 SUPERIOR Swingcrane — used. for resale purposes.

BARDALE EQUIPMENT, INC.

2646 Creve Coeur Dr — St. Louis 17, Mo.

Phone: WOodland 1-6930

L-G #14-41B—BUCYRUS-ERIE Caterpillar Steam Crane, 75' boom, Serial #10976. Rebuilt 1948 by H. O. Penn Machinery at a cost of $8,117. New International Vertical Firetube Boiler (150# W.P.) and Oil Burning Equipment installed 1948. Presently working — Excellent Condition. $11,000 f.o.b. our yard.

L-G #15-41B—BUCYRUS-ERIE Caterpillar Steam Crane, 65' Boom—10' Extension, Serial #4761. Rebuilt 1947 by H. O. Penn Machinery at a cost of $7,175.89. Installed New Oil Burning Equipment and New International Vertical Tube Boiler (150# W.P.) in 1948. Excellent condition. $11,000 f.o.b. our yard.

LINDE-GRIFFITH CONSTRUCTION CO.

152 Passaic St. — Newark 4, N.J.

Phone: HUmboldt 2-0641-2

Announcing Opening of Texarkana Truck Parts Co. in our larger location

(Special) Dump Beds and Hoists also GMC Gas and Water Tankers 750 to 1350 gal. capacity.

Over 7 acres full of good used parts for G.I. Trucks — Trailers — Half and Full Truck Units, ¼ to 20 ton capacity — Engines — Axle Assemblies — Winches . . . . . Complete line of spare parts (new and used) for Jeeps, Chev. GMC, Fords, Federals, Mack, Diamond T, Reo, International, and others too numerous to mention.

25-Ton 4-Wheel Semi-Trailer	$1495
7-Ton Hercules Tractor, like new, 6 available	$ 995
1-N-R. Mack 10-ton diesel	$3750

John P. Fuzy, Mgr.

TEXARKANA TRUCK PARTS CO.

Dallas Highway 67 — West 7th St.

Phone 3-28832 — P.O. Box 771

TEXARKANA, TEXAS

FOR SALE CHEAP

Adnun Asphalt Paver, Serial 199, gasoline	$ 1,500
Asphalt Plant Drier, 55"x24', rubber tires, steam burner, cold conveyor, feeder, gas power	3,000
Cleaver Brooks Tank Car Steamer, portable, Ser. 314-37, model DA	1,200
60 h.p. locomotive type, portable, asphalt plant boiler, oil burner, 150#	1,400
Cedar Rapids Crushing Plant, portable, Ser. 3577, 1036 RB jaw, 30x18 RB rolls, 42"x14' double deck Symons Screen, 30" feed conveyor, 24" delivery conveyor, feeder, D-13000 Cat Power, completely overhauled	15,000
Model K Allis Chalmers Tractor and GarWood, 2-3 c.y. hydraulic scraper with control unit	1,000
628 c.f. Ingersoll Rand single stage compressor, No. 71053, 14 x 13, Class ES-1, 100 h.p. electric motor, 3'x8' air receiver, skid mounted	4,000
460 c.f. Ingersoll Rand single stage compressor, 12"x13", type ES-1, 3'x8' air receiver, 75 h.p. electric motor, skid mounted	3,000

All in Good Working Condition

F.O.B. Yard At:

THORNTON BROTHERS CO.

1343 Dayton Avenue

ST. PAUL, MINNESOTA

WANTED

200 or 250 KW Generator, 220-440, 60 cycle, three phase Diesel Driven.

Apply Box No. 1159

ROADS and STREETS

22 W. Maple Street

Chicago 10, Illinois

PORTABLE BELT CONVEYOR

BARBER - GREENE Model 363, practically new, 24-inch x 30 feet belt, Wisconsin VE-4 17 HP motor, 4 ply, 28 oz. belt. Under-track hopper with gates.

Douglass Construction Co.

P. O. Box 1104 — Phone 3-8414

Columbia, S. C.

WANTED

MANITOWOC Model 2000

Crane, OR Shovel or Backhoe

Either Gasoline OR Diesel

ANDERSON EQUIPMENT CO.

Box 1737, Pittsburgh 30, Pa.

Phone: LEhigh 1-6020

With the Manufacturers and Distributors

New Company Enters the Construction Equipment Field

General Road Machines, Inc. has been founded by DONALD T. HELTZEL, JACK J. MARCELLO and MICHAEL J. HUDIS. The company will manufacture and distribute a complete line of concrete highway and air port construction equipment. Mr. Heltzel is president and treasurer; Mr. Marcello, vice president in charge of sales and secretary; and Mr. Hudis, vice president in charge of production and design.

All three officers have resigned their former positions with The Heltzel Steel Form and Iron Co. and The Flexible Road Joint Machine Co. (Flex-Plane Co.), both of Warren, O. Heltzel has been associated with both companies since discharge from the U. S. Navy in 1946. His last position was vice president and general manager of The Flexible Road Joint Machine Co. and in charge of sales promotion activities for The Heltzel Steel Form and Iron Co.

Mr. Marcello comes to General Road Machines with 20 years experience in the highway construction field. He began his business career at Flexible Road Joint Machine Co., his last position there being manager of sales. Mr. Marcello has

Donald T. Heltzel

a nation-wide reputation as an expert in the concrete equipment industry.

Mr. Hudis started his business career at Heltzel Steel 23 years ago, advancing through various positions of supervision in the Production Department. In recent years, Mr. Hudis has made outstanding contributions in the field of highway machinery design.

The main offices and plant of General Road Machines are located in Niles, O. A divisional office and factory are located at Newton Falls, O. Plans are underway for an 18,000 sq. ft. addition to the Newton Falls Division. A third factory is scheduled for operation in the south western United States in 1956.

Mr. Marcello has announced that applications from distributors for the General Road "Five-Star Line of Equipment" are now being processed. General Road is delivering concrete finishing machines, road forms, curb, gutter, and sidewalk forms and miscellaneous concrete equipment now. Scheduled for production in mid-May is a newly designed concrete spreader. Following at about 4-week intervals on the production schedule is a concrete float machine, a sub-grading machine, and a newly created machine which Heltzel would only designate as a "final finisher."

THREE NEW APPOINTMENTS BY U.S. RUBBER. Three appointments have been announced in the U. S. truck tire department of United States Rubber Co. by H. C. Oliver, sales manager of the U. S. tires division. H. W. Dodenhoff has been made manager of truck tire sales; J. F. Arthur becomes manager of fleet sales; and C. E. Drennen has been named manager of national accounts.

GALION ALLSTEEL APPOINTS NEW DISTRIBUTOR. Acme Spring and Equipment Co., 385 East Livingston Ave., Columbus, O., has been appointed distributor by the Galion Allsteel Body Co., Galion, O., for central and southern Ohio for Galion Allsteel dump bodies and hydraulic hoists.

LAACK NEW FWD ADVERTISING MANAGER. Arthur J. Laack has been appointed manager of advertising and sales promotion for the Four Wheel Drive Auto Co., Clintonville, Wis. He succeeds Arthur J. Danley who has been promoted to director of public relations.

. . . for more details circle 182, page 16

● Caterpillar's new 583 Pipelayer in action. New hydraulically actuated counterweights, pivoting at the bottom, give the unit improved ground and side clearance. Revolutionary in design, the counterweights are split on each side of the winch mechanism for improved balance making for ease in steering. The machine lowered 700 ft. of 30 in. pipe at the rate of two miles per day on R. H. Fulton job near Greensburg, Ka.

EVERY NAMED ASSISTANT GENERAL SALES MANAGER. Paul J. Every has been appoined to the newly created position of assistant general sales manager of Cummins Engine Co., Inc., Columbus, Ind. Mr. Every has been associated with Cummins since Nov. 1, 1947, and, as manager of regions, was in charge of the operation of the 12 domestic Cummins regional offices, and the handling of domestic distributor activities. For the past two years, he has been responsible for the world-wide activities of Cummins Diesel Export Corporation.

TIMKEN TO BUILD ROCK BIT PLANT IN CANADA. The Timken Roller Bearing Company, Canton, O. has announced plans to construct a rock bit producing facility at its St. Thomas, Ont. plant. It is estimated rock bit production will get started around September 1955. Cost of the building and equipment is estimated at about $250,000.

NEW GALION ALLSTEEL BODY DISTRIBUTOR. The Galion Allsteel Body Co., Galion, O., has appointed C & M Equipment Co., 1708 Central Ave., N. E., Minneapolis, Minn., Minnesota distributors for Galion Allsteel dump bodies and hydraulic hoists.

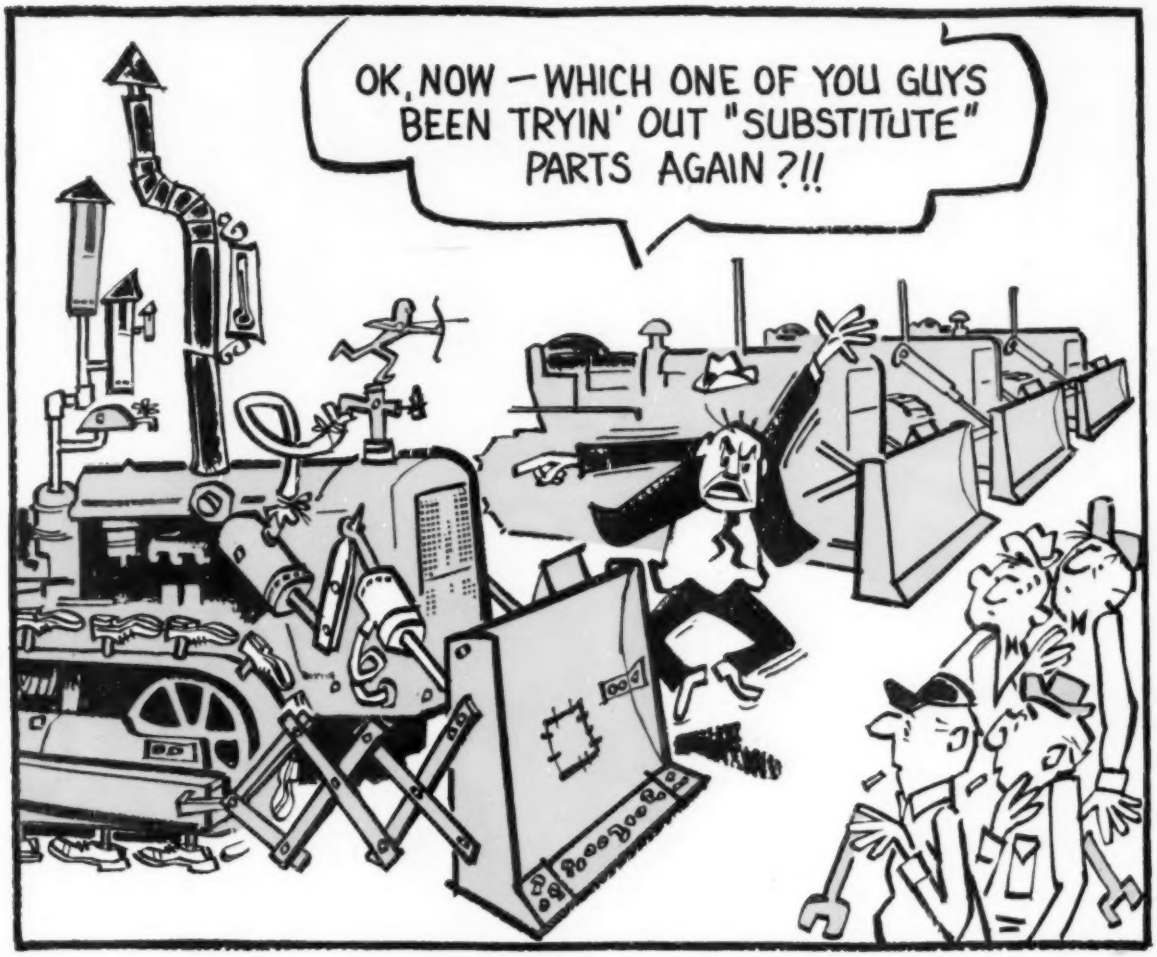
CONSOLIDATED SALES DEPARTMENT FOR MARION-OSGOOD. Establishment of a consolidated sales and service department, for the entire line of Marion-Osgood-General equipment in both the domestic and export markets has been announced today by Marion Power Shovel Co. D. E. Rizor has been named to head the coordinated program as vice-president for sales and service. A member of the Marion Power Shovel Co. for the past 29 years, he previously was vice president in charge of service, parts and pricing. Kenneth E. Williamson, Marion-Osgood-General sales manager, small machines, is concentrating his activities in the sale of equipment in sizes of 4 cu. yd. and under through a distributor organization throughout the United States and Canada. Richard M. Bessom as export sales manager is in charge of sales of the complete line of machines through a worldwide organization of distributors abroad.

MURRAY NAMED B-L-H EXECUTIVE. George A. Rentschler, Chairman of the Board, has announced the appointment of Robert B. Murray, Jr., recently resigned Under Secretary of Commerce for Transportation, as special assistant to the president of the Baldwin-Lima-Hamilton Corp. Murray, who resigned after two years as one of the chief aides to U. S. Secretary of Commerce Sinclair Weeks to re-enter private business, will be based in Philadelphia.

. . . for more details circle 164, page 16

INDEX TO ADVERTISERS

Advertisers with * are represented in the 1955 edition of Gillette's Heavy Construction Prefiled Catalog. Please refer to it for additional information on any of their products.



Down time is no joke. Best way to avoid it is to insist on genuine CAT* parts every time. Then you're sure of getting parts that are made to the latest design, precisely manufactured of the right materials, rigidly inspected and tested.

Take filters, for example

Non-genuine Caterpillar filter elements look like the real thing. They'll fit, too. They may even have plastic-impregnated elements — but how much surface area do they have? Look at the picture below. It shows what a genuine Cat surface-type filter is like *inside:* a plastic-impregnated paper element that does not absorb water, accordion pleated, for maximum surface area, around a perforated metal tube, enclosed in a perforated paper cover. This filter will *not* remove oil additives. It *will* remove abrasive particles as tiny as 39-millionths of an inch. A substitute filter — well, who can be sure?

The difference on the job: working in heavy dust, even in mud and water, genuine Cat filters — matched to the requirements of Caterpillar Diesel Engines — will keep these engines running longer, will keep maintenance costs low.

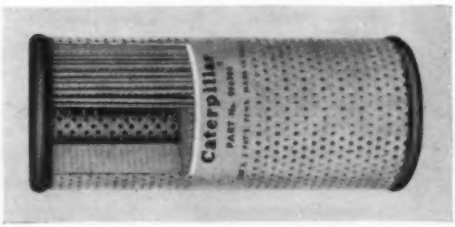
With substitute parts: who can be sure?

Better get genuine Caterpillar parts every time.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®



. . . for more details circle 172, page 16

The Asphalt Institute moves to University of Maryland

Universal testing machine for applying compressive loads to specimens of Asphalt paving mixes.

Unique multiple-temperature control apparatus for laboratory testing of Asphaltic materials.

— a significant development for road builders and other Asphalt users

As a member of The Asphalt Institute, The Texas Company takes pride in calling attention to the Institute's new, larger and better-equipped quarters on the campus of the University of Maryland. The new building was officially dedicated early this month.

To America's road builders in particular, but to all other asphalt users as well, this move is important because it substantially increases the capacity of The Asphalt Institute to serve them.

The new laboratory, which occupies the entire first floor of the Asphalt Institute Building, is several times as large as the former "lab" and it is equipped with a number of new pieces of testing equipment.

At the rear of the building, there is a large tract of ground which will be used to test the performance of asphalt under actual service conditions.

With the nation on the threshold of the biggest highway construction program in its history, this substantial enlargement of the capacity of The Asphalt Institute to serve road builders is particularly timely.

THE TEXAS COMPANY, Asphalt Sales Div., 135 E. 42nd Street, New York City 17

Boston 16 Chicago 4 Denver 1 Houston 1 Jacksonville 2 Minneapolis 3 Philadelphia 2 Richmond 19

TEXACO

REG. T. M.

TEXACO ASPHALT